GEOGRAPHY,
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EDISON ELECTRIC INSTITUTE BULLETIN

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BLISHED MONTHLY BY EDISON ELECTRIC INSTITUTE

FARM ELECTRIFICATION DATA BY STATES

1942 Compared with 1940

State	Number of Farms	Dwellings Within ¼ Mile Distribution Line Number	Dwellings Within ¼ Mile Distribution Line %	Dwellings Lighted by Electricity — U. S. Census Data as of April 1, 1940 — Total Electrified Number	%	Home Plants Number	%	Dwellings Lighted by Electricity — Number and % on Power Lines — (April 1, 1940) Number	%	EEI Data (Dec. 31, 1940) Number	%	EEI Data (Dec. 31, 1942) Number	%
Total United States	6,096,799	2,780,207	45.6	2,032,316	33.3	179,067	2.9	1,853,249	30.4	2,069,759	33.9	2,486,235	40.8
Maine	38,980	24,160	62.0	21,124	54.2	903	2.3	20,221	51.9	21,246	54.5	23,560	60.4
New Hampshire	16,554	12,374	74.7	11,184	67.6	339	2.1	10,845	65.5	11,616	70.2	13,510	81.6
Vermont	23,582	14,855	63.0	12,873	54.6	660	2.8	12,213	51.8	13,103	55.6	15,240	64.6
Massachusetts	31,897	28,043	87.9	26,648	83.5	428	1.3	26,220	82.2	26,757	83.9	27,200	85.3
Rhode Island	3,014	2,644	87.7	2,511	83.3	54	1.8	2,457	81.5	2,497	82.8	2,560	84.9
Connecticut	21,163	18,542	87.6	17,494	82.7	499	2.4	16,995	80.3	17,304	81.8	18,100	85.5
New England	*136,190*	*100,818*	*74.4*	*91,834*	*67.9*	*2,883*	*2.1*	*88,951*	*65.8*	*92,523*	*68.4*	*100,170*	*74.1*
New York	153,238	115,879	75.6	106,804	69.7	4,521	3.0	102,283	66.7	106,531	69.5	114,650	74.8
New Jersey	25,835	23,056	89.2	21,695	84.0	397	1.6	21,298	82.4	21,632	83.7	23,260	90.0
Pennsylvania	169,027	121,282	71.8	98,937	58.5	4,856	2.9	94,081	55.6	101,095	59.8	114,660	67.8
Middle Atlantic	*348,100*	*260,217*	*74.8*	*227,436*	*65.3*	*9,774*	*2.8*	*217,662*	*62.5*	*229,258*	*65.9*	*252,570*	*72.6*
Ohio	233,783	170,897	73.1	143,436	61.4	5,756	2.5	137,680	58.9	149,563	64.0	169,120	72.3
Indiana	184,549	123,662	67.0	95,575	51.8	4,448	2.4	91,127	49.4	106,185	57.5	128,730	69.8
Illinois	213,439	114,088	53.5	87,611	41.0	7,584	3.5	80,027	37.5	95,293	44.6	117,620	55.1
Michigan	187,589	153,042	81.6	133,095	71.0	1,960	1.1	131,126	69.9	136,546	72.8	154,240	82.2
Wisconsin	186,735	126,287	67.6	95,158	51.0	7,602	4.1	87,556	46.9	94,188	50.4	105,720	56.6
East North Central	*1,006,095*	*687,976*	*68.4*	*554,875*	*55.1*	*27,369*	*2.7*	*527,516*	*52.4*	*581,776*	*57.8*	*675,430*	*67.1*
Minnesota	197,351	80,220	40.6	59,838	30.3	9,763	4.9	50,075	25.4	55,736	28.2	75,860	38.4
Iowa	213,318	107,359	50.3	86,786	40.7	13,478	6.3	73,303	34.4	89,103	41.8	114,140	53.5
Missouri	256,100	74,035	28.9	45,355	17.7	6,151	2.4	39,204	15.3	49,671	19.4	66,630	26.0
North Dakota	73,962	7,310	9.9	11,446	15.5	8,228	11.1	3,218	4.4	4,047	5.5	5,840	7.9
South Dakota	72,454	8,444	11.7	12,845	17.7	8,864	12.2	3,981	5.5	4,518	6.2	6,750	9.3
Nebraska	121,062	40,969	33.8	34,886	28.8	12,054	9.9	22,832	18.9	27,259	22.5	32,380	26.7
Kansas	156,327	45,067	28.8	41,549	26.6	13,589	8.7	27,960	17.9	31,683	20.3	37,200	23.8
West North Central	*1,090,574*	*363,404*	*33.3*	*292,705*	*26.8*	*72,127*	*6.6*	*220,573*	*20.2*	*262,017*	*24.3*	*338,800*	*31.1*
Delaware	8,994	6,096	67.8	3,699	41.1	154	1.7	3,545	39.4	4,348	48.3	5,637	62.7
Maryland	42,110	23,700	56.3	18,351	43.6	1,234	3.0	17,117	40.6	18,539	44.0	24,670	58.6
District of Columbia	65	60	92.3	54	83.0	1	1.5	53	81.5	53	81.5	53	81.5
Virginia	174,885	77,255	44.2	44,348	25.4	2,204	1.3	42,144	24.1	47,056	26.9	57,630	33.0
West Virginia	99,282	36,958	37.2	26,735	26.9	1,536	1.5	25,199	25.4	27,922	28.1	31,770	32.0
North Carolina	278,276	124,017	44.6	71,196	25.6	3,569	1.3	67,627	24.3	77,414	27.8	98,920	35.5
South Carolina	137,558	56,731	41.2	28,764	20.9	1,196	0.9	27,568	20.0	37,382	27.2	48,870	35.5
Georgia	216,033	88,427	40.9	43,958	20.3	1,549	0.7	42,409	19.6	53,683	24.8	71,040	32.9
Florida	62,248	25,063	40.3	16,472	26.5	996	1.6	15,476	24.9	16,403	26.4	20,440	32.8
South Atlantic	*1,019,451*	*438,307*	*43.0*	*263,577*	*24.9*	*12,439*	*1.2*	*241,138*	*23.7*	*282,800*	*27.7*	*359,030*	*35.2*
Kentucky	252,894	79,740	31.5	42,288	16.7	3,681	1.4	38,607	15.3	44,372	17.5	60,560	23.9
Tennessee	247,617	74,276	30.0	40,519	16.4	1,635	0.7	38,884	15.7	42,676	17.2	53,000	21.4
Alabama	231,746	77,579	33.5	35,725	15.4	1,815	0.8	33,907	14.6	43,440	18.7	55,900	24.1
Mississippi	291,092	85,647	29.4	27,670	9.5	1,592	0.5	26,078	9.0	29,059	10.0	36,980	12.7
East South Central	*1,023,349*	*317,242*	*31.0*	*146,202*	*14.3*	*8,726*	*0.9*	*137,476*	*13.4*	*159,547*	*15.6*	*206,440*	*20.2*
Arkansas	216,674	58,732	27.1	23,435	10.8	2,132	1.0	21,303	9.8	26,026	12.0	35,980	16.6
Louisiana	150,007	46,694	31.1	17,187	11.5	1,129	0.8	16,058	10.7	18,262	12.2	23,970	16.0
Oklahoma	179,687	43,128	24.0	28,280	15.7	8,131	4.5	20,149	11.2	23,369	13.0	34,160	19.0
Texas	418,002	147,349	35.3	93,577	22.4	14,450	3.5	79,127	18.9	93,474	22.4	120,480	28.8
West South Central	*964,370*	*295,903*	*30.7*	*162,479*	*16.8*	*25,842*	*2.7*	*136,637*	*14.2*	*161,131*	*16.7*	*214,590*	*22.3*
Montana	41,823	10,614	25.4	11,688	27.9	3,741	8.9	7,947	19.0	8,745	20.9	10,550	25.2
Idaho	43,663	28,931	66.3	26,384	60.4	945	2.1	25,439	58.3	28,801	66.0	32,170	73.7
Wyoming	15,018	4,655	31.0	5,184	34.5	1,710	11.4	3,474	23.1	3,954	26.3	5,070	33.8
Colorado	51,436	20,040	39.0	19,735	38.4	4,912	9.6	14,823	28.8	16,648	32.4	21,810	42.4
New Mexico	34,105	7,644	22.4	6,554	19.2	2,075	6.1	4,479	13.1	4,834	14.2	6,090	17.9
Arizona	18,468	6,577	35.6	6,031	32.7	424	2.3	5,607	30.4	6,191	33.5	6,780	36.7
Utah	25,411	18,510	72.8	17,714	69.7	303	1.2	17,411	68.5	18,478	72.7	19,750	77.7
Nevada	3,573	1,770	49.5	1,812	50.7	257	7.2	1,555	43.5	1,599	44.8	1,700	47.6
Mountain	*233,497*	*98,747*	*42.3*	*95,102*	*40.7*	*14,367*	*6.1*	*80,735*	*34.6*	*89,250*	*38.2*	*103,920*	*44.5*
Washington	81,686	62,843	76.9	60,082	73.6	1,799	2.2	58,283	71.4	61,385	75.8	67,550	82.7
Oregon	61,829	41,245	66.7	38,010	61.5	1,641	2.7	36,369	58.8	39,519	63.9	43,530	70.4
California	132,658	113,705	85.7	110,014	82.9	2,110	1.6	107,904	81.3	110,054	83.0	124,200	93.6
Pacific	*276,173*	*217,793*	*78.9*	*208,106*	*75.4*	*5,550*	*2.0*	*202,556*	*73.3*	*211,458*	*76.6*	*235,280*	*85.2*

The accompanying un-numbered tabulation based on the Census of Agriculture report as of April 1, 1940, 1930 and 1920, shows the relative place of electricity among other farm facilities such as automobiles, telephones, trucks and tractors:

	Electrically Lighted Homes	Automobiles	Telephones	Trucks	Tractors
Number on April 1, 1940	2,032,316	3,542,036	1,526,954	944,184	1,409,69
Number on April 1, 1930	845,356	3,650,003	2,139,194	845,335	851,45
Number on April 1, 1920	452,620*	1,979,564	2,498,493	131,551	229,33

* Electricity or gas.

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ANNUAL MEETING OF THE INSTITUTE

THE Annual Meeting of the Institute will be held at the Waldorf-Astoria Hotel, ew York, Thursday, June 3rd. Shortened to nform to war-time conditions, the meeting ill be preceded by an all-day Executive Conerence under the auspices of the Operating ommittee at the same location on Wednesday, une 2nd.

The Meeting on June 3rd will be open to both embers and non-members of the Institute, hile *attendance at the Operating Committee Executive Conference on June 2nd will be limited to members of the Committee and to officers and employees of member companies of the Institute.*

A part of the open meeting on June 3rd will e devoted to addresses and discussions on postar planning and technical advances and probems, while matters of immediate urgency will ominate the Executive Conference on June nd.

Speakers at the open meeting on June 3rd will nclude President Kellogg, who will deliver he annual presidential address; Mr. W. C. Mullendore, Southern California Edison Company, whose subject will be "Some War-Time Revelations"; Mr. H. M. Sawyer, American Gas and Electric Company, who will talk on "Helping Small Industry as Future Customers", and Mr. H. V. Erben, General Electric Company, will discuss the possibilities present in the standardization of heavy electrical apparatus.

Mr. H. C. Thuerk, Bradford Electric Company, and Chairman of the new EEI Committee on Post-War Planning, will make an initial report to the industry on Planning to Be Done; Mr. C. A. Powel, Westinghouse Electric and Manufacturing Company, will talk on the need for consulting now on post-war technical problems, and Mr. Carroll L. Wilson, Executive Secretary of the Committee for Economic Development, will tell of the work of this new national organization.

Subjects at the closed Conference on June 2nd will include discussions on these phases of the manpower and employment situation: Deferment experience and losses to other industries; meeting labor shortages; experience with 48-hour week; replacement schedules and manning tables; training replacements. Other subjects of immediate interest scheduled for discussion include: Inventories and supplies; an appraisal of load behavior and outlook; rates of the Southwest Power Pool; observations on a recent rate case; fuel clauses; billing practices; managing with curtailed transportation; status of airport legislation; review of public ownership developments and recent technique in municipal ownership promotion.

Speakers and discussion leaders at the Operating Committee Conference will include Samuel Ferguson, Hartford Electric Light Company; J. A. Longley, Commonwealth and Southern Corporation; C. E. Kohlhepp, Chief, Inventory Control Branch, O.W.U.; L. R. Lefferson, Ebasco Services Incorporated; F. A. Newton, Commonwealth and Southern Corporation, and H. S. Bennion, Edison Electric Institute.

Chief executives of member companies will be supplied in advance with the complete programs of the two meetings, at which other speakers than those already named will appear.

The Operating Committee Conference, June 2nd, will begin promptly at 9:00 a.m. and carry through continuously until 5:30 in the afternoon except for a luncheon intermission. The morning session of the annual meeting, June 3rd, will begin at 9:45 a.m. and be followed by a luncheon session at which a speaker of outstanding importance will be heard. The final session will begin at 3:00 p.m.

Looking Back to View the Future

An Introduction to Post-War Planning

By Frank Sanford
Cincinnati Gas & Electric Co.

Presented to Joint Meeting, Transmission & Distribution, and Electrical Equipment Committees, Edison Electric Institute, at Edgewater Beach Hotel, Chicago, May 10, 1943

CURVES of plotted data are favorite and reliable tools of engineers and business men. When they show past records, they are useful in arriving at a perspective of influences and effects. When judiciously interpreted, they may also be useful in predicting trends for future or untested conditions. Forecasts based on extension of past business or historical events can be hazardous because of the multiplicity of intangible factors involved, but there may be considerable basis for the statement "history repeats itself."

Even a casual review of conventional history leads to the conclusion that the world has never returned to the full condition of previous so-called "normal" after a major upheaval in its political affairs. During tremendous armed conflicts, new ideas receive quick attention, inertias are pushed aside and developments are accelerated. The economy that follows is affected by these sharp and short-time changes and accelerations to a much greater extent than commonly appreciated.

There are three periods ahead of us:

1. We must win the war in a dozen places and in hundreds of industrial plants. Warfare has become a matter of materiel as well as men. Armies with the most efficient airplane engines; bombers with the best navigation aids; navies with the most reliable electronic guides, will win. Battles move. Armor plate must replace earthen barriers. Power and speed of communication and of travel are vital in the new strategy. And they require power and materials for production.

2. We must plan for the post-war years in both political alignments and in industrial production. Winning the war would be an empty victory if it brought only chaos. Plans are as essential for a period of transition as they are for the military campaigns. Many machines and many plants will be left idle on V-day. But millions of machines will be worn out. Our economists expect a post-war boom before there is a post-war depression.

3. We must look beyond those first few years. After the period of scarcity adjustment and employment dislocations of the immediate post-war years, is there anything new to expect? We hope that governments will look further than the first peace table in the settlement. Industry—men with capital, engineers, managers—must be just as far-sighted. Short sight is already confusing political post-war plans with proposals for government spending on large scale public projects. Industry has more to offer America than roads, canals and tax-free business competition.

Economists and statisticians and engineers have enough data on the needs of the public to predict the number of automobiles, tires, refrigerators, radios and other peace items that industry must provide. The total national income has been calculated. Its division among industries can be estimated.

In the electric supply business we can determine the number of new transformer banks and feeders that will be needed to catch up with the war-time shortages. We can estimate the deferred maintenance, and the replacements of war-torn equipment. We should do as much of that planning as we can now, even if it means some more overtime thinking beyond war supply layouts.

Then are we through? Do we simply go back to where we were in the thirties and look for the good old normal? History says that the answer is "No." A few points on the curve of progress can give us a basis for better perspective. Its extension leads to an optimistic conclusion, and a little optimism may be a good feeling at times like the present. Our children in school see the world through our opinions, and the news reports of a world in chaos. They, too, are vitally interested in the extension of this curve beyond the immediate post-war years.

* * *

There was another time when Continental Europe was in the hands of a dictator. World affairs were in a mess. National debts, taxation, destruction, disturbances had mounted to staggering totals. Russia followed a scorched-e policy and backed him down. A sec front was established through Spain a another front was necessary in Belg before the dictator was met at Wate

That brought the end of a period turmoil that had lasted for half a c tury. In the political settlement a actionary feeling had control, and peace aim was to return to the condi of pre-revolutionary Europe. A p simistic philosopher, Arthur Scho hauer, expressed the prevalent poli feeling. He wrote that the world wo be a happier place if all people wo quit wanting. The world had mo too fast and everyone should be satis with conditions as they were in the g old days. This peace settlement on Continent was maintained for a gen tion. But scientists and industri did not accept this philosophy.

REVOLUTIONS

Revolutions had set the pace. Ro of the American colonies, the Fre Revolution and the British Indust Revolution changed the three count to entirely new patterns. Still anot revolution in thinking is almost o looked in conventional history. through history we find these t parallel streams: the political, headi current events; the handicraft, manu turing, industrial; the search for knowledge, science. Each is influe by the others, and each leaves a her for further development by a later g eration.

About the time that a shipment o was dumped into the harbor at Bo James Watt was working on his provements of a steam engine to p water from the coal mines in Scot Watt was a practical business ma well as an expert mechanic. He sol engines on the basis of payments savings of fuel cost compared to for the horses. By itself, Watt's m would be relatively unimportant in tory.

The demand for textiles in Engl growing world trade led to invent the spinning jenny, then the spi

frame. They were combined into the spinning "mule" and power was needed to drive this machinery. Iron was needed to build the machines and the steam engines, and the puddling process for iron purification followed. This process, as well as the engines, required more coal and iron mining. More machines could handle more textiles, and that called for more trade. The Industrial Revolution was a spiral of development.

America's Declaration of Independence was parallelled by another declaration of freedom from tradition. An English clergyman, Joseph Priestley, made some experiments with an oxide gas. He declared that it was a new element. If he was right, the alchemists had been wrong for centuries. Henry Cavendish proved that Priestley's gas and hydrogen would combine to form water. In France, Antoine Lavoisier repeated and extended these experiments and wrote the first book on chemistry. He lost his life in the French Revolution but he had opened new doors of knowledge for later development.

An Italian physician, dissecting muscle tissue in frog legs, found that a spark from his frictional electric machine would cause a twitch in the muscle. Dr. Galvani concluded that life itself was an electrical phenomena. This is important to us now only in that it aroused the interest of another scientist, Alessandro Volta, who set out to prove Galvani was wrong. He soon realized that the frictional electric machine was a weak and spasmodic source of electricity. He invented a chemical battery to give a steady electric current.

We can plot the first point on our curve of advance.

NAPOLEON

Napoleon moved into top spot in France and planned to take over the management of all the neighboring countries. Another young man, Humphry Davy, became top chemist of the new Royal Institution in London. He was soon a leader in spreading scientific interest. Chemists developed fertilizers, tannic acid for leather, illuminating gas manufactured from coal, optical glass. A physician developed vaccination for the dread smallpox.

A young American studying portrait painting in England became interested in boats and in Watt's steam engine. He went to France to build a steamboat, but Napoleon was not interested in the idea. Robert Fulton then returned to America, where the spirit of enterprise was rapidly developing. The struggles in Europe were benefitting America, by creating a need for home industries. They also helped America to close the greatest real estate deal in history, because Napoleon needed the money.

Conventional history records the westward movement in the post-war period after the world conflicts ending in 1815. America expanded into the vast areas west of the coastal states. Europeans sought new lives in the land of opportunity. Great Britain expanded her manufacturing and commerce into world-wide trade.

Steam engines were driving ship propellors, and the next step was to make them drive wheels. The problem was one of engineering efficiency. Earlier models would not leave space for payload on any carriage that would move the engine and boiler and the fuel. Determined efforts in the post-Napoleonic era brought the necessary locomotive developments. Power was applied to give us speed of travel.

Michael Faraday started his career in the Royal Institution about the time Napoleon went for a long rest on St. Helena. This was the most active period in the history of science. Chemistry and the current of Volta's battery were joining in new possibilities. Rans Oersted, a professor in Copenhagen, suggested the relationship of magnetism and the electric current. Andre Ampere, of the Academy of Sciences in Paris, confirmed and extended the theory. Faraday added motion to the ingredients of these experiments. His generator and transformer were the scientific foundations for an electrical age that would wait fifty years for full incentive to start.

A young American school teacher repeated the European experiments, and designed some huge lifting magnets. He arranged a magnet and line so that his wife could call him home from his laboratory. Joseph Henry's telegraph needed the imagination of Samuel Morse to add the dots and dashes for commercial use.

Point two on our curve includes chemistry, steamboats, railroads and electrical fundamentals.

CIVIL WAR

News of the battle at Gettysburg was flashed by telegraph to all parts of the United States. The telegraph had become an important part of military operation, and the war was giving great impetus to this application of science. Operators were in great demand, and thousands of young men learned about batteries and magnets.

Steel, reapers and sewing machines were other developments that became important in the economy of a country at war. The full importance of railroads was realized and new construction was authorized, including the first road to the West Coast. Manpower shortages and new demands brought many new industries and encouraged machine production.

Several young men started their careers after the war, with improvements in telegraphy, railroading and steel. In twenty years they were leading America into a new era founded on the telephone, electric light, generator and air-brake inventions. America became the leading producer of steel. Brooklyn Bridge, steel buildings, bicycles, baseball, typewriters were a part of this period, and street cars were being planned.

Invention became a business. Science was applied in organized effort to produce new tools. In the forty years from 1860 to the end of the century, the number of patents issued was fifteen times as great as in the seventy-five years before the war.

Three leaders of this era were eighteen years old at the end of the war. Thomas Edison was a telegraph operator, George Westinghouse was in the navy, Alexander Graham Bell was teaching in London. Frank Sprague and Charles Brush were two years younger. Andrew Carnegie was thirty.

Engineers were needed for the expansion of American industry. There were four colleges with engineering courses before the war. There were eighty-five in 1880.

Point three on our curve is America's Industrial Revolution—the Gilded Age.

WORLD WAR

Toward the close of the century, a European internal combustion engine and a scientific interest in air and sound waves were attracting attention. Invention and research brought the automobile, wireless and airplane. By 1914 the first two were in practical use—one along rough streets, the other on ships and in the rooms of young amateurs. Moving pictures were coming out of the nickelodeon period. Turbines were replacing Watts' reciprocating engines. Power was being sent by wire instead of belts and line shafts.

Kitchen utensils were being made with aluminum, which was a product of chemistry aided by electricity. But, in general, America had only slight interest in industrial chemistry. Germany was the world leader in this field.

The war gave huge driving force to

these new developments. In 1916, the manufacture of automobiles equaled the total produced in all the years before the war. Wireless repeated the telegraph experience of the Civil War. Stopping German imports forced American industry to concentrate on chemistry. Dyes and other chemicals were needed, and new processes and plants were necessary for their production. Aluminum was needed for the huge airplane development that came with war demands.

In the ten years that followed, automobile production increased to three times its war level. Electric customers increased to six times the number before the war as service was domesticated. Radio announced the election results of 1920. Moving pictures borrowed new techniques from radio to give life to the films. Airplane flights were made across the Atlantic. Each city wanted its airport.

There is no doubt but that these developments would have continued without the disaster of warfare. But there is likewise no doubt but that war greatly accelerated them. At least something was salvaged from the crazy pattern of the conflict. These indications, and many others, give us another point on our curve.

By the thirties, a reaction had set in. Some pessimists were digging out Schopenhauer's philosophy. Others turned to Marx and Blanc for their theories, or worked out some new ideas that technical development should be given a holiday.

NOW

In retrospect, these steps seem logical and steady. The history of 150 years is written in Power and in Speed of Travel and of Communication. There was enough material—men could even cut trees to burn or to push aside for a clear space to plant corn. Now, we are realizing that we could have shortages of iron, copper, lumber and oils.

Science and invention have turned to Materials. Magnesium, synthetics and plywood are familiar terms. Electricity and radio have a new partner—electronics. Chemistry and electricity have given medical science new tools. Gasoline has passed what was thought to be 100 per cent efficiency in the octane scale. Shortages of foods are leading to a new understanding of vitamins and nutrition.

Thousands of young men are learning new technical skills. Radar operators of this war will follow the telegraph and wireless operators of the two previous wars. Television will be a natural after the job they are doing now. Materials developed for airplanes can be adapted for use in housing and automobiles. Sanitation chemistry for the tropical jungles may help our local sewerage problems.

All of the pump priming and artificial stimulants of the thirties are dwarfed by these potential assets. The inertias of a decade are washed out. Pre-war possibilities have become realities. They can be turned to peaceful pursuits.

Power and production depend on electric service. There was more electric power increase in the first year of this war than there was in total use at the end of the first world war. New methods turn to electricity as an aid. It is helping in materials, in medical treatment, in food processing. Electric service is ready for its fourth phase of development.

Airplanes—like automobiles 25 years ago—are pointing to new possibilities. More can be made in one year now than the total built in all the years before this war. New materials and electrical aids are increasing their dependability and scope of usefulness.

Synthetics, plastics, alloys, electronics—they are all part of a renewed interest in science. Scientists started the cycle of Power and Speed. Now they are starting a cycle of Materials.

Social science has lagged far behind physical science. Materials, medical science and chemistry bring scientific thinking closer to people. There is promise that there will be beneficial results of the new unions of effort and development, just as chemistry and electricity have been of mutual benefit as partners in science and production.

Research, the organized application of science, has set a new pace for advancement. It has replaced the individual and uncertain efforts of the early scientists and inventors. From Watt's condenser to the steamboat required 38 years, to the railroad 56 years. From Morse's telegraph to Bell's telephone was 39 years, but from Marconi's patent to voice wireless was only 14 years. From Faraday's discovery to Edison's distribution was 50 years, but less than 20 years later turbines were necessary to match the growth of electric power demands.

Research has proven its capacity to serve and has continued to increase in importance. It assures further progress and the attainment of goals for improvement of living standards. It is the key to our era, and of new things to come.

If we accept this basic philosophy [in] the future, we have a starting point [for] long term post-war planning and thin[k]ing. An era of Materials, and of scien[ce] and business that is closer to people, w[ill] have profound effects on many indu[s]tries. Research will bring the chang[es] faster.

Manufacturers will need to th[ink] more of chemistry, of plastics, of ne[w] supplies, as they may apply to their pro[d]ucts. Real estate interests, doctors, ed[u]cators, the corner retailer and ma[ny] others will need to make changes [to] match these new conditions.

Electricity, in gigantic proportions [in] machine and magnesium production, [is] just as essential in the electronic devic[es]. In between will be many new and im[-]proved devices and appliances for th[e] home. Prefabricated housing will inclu[de] adequate appliance and lighting pro[vi]sions as fundamental convenience[s]. Domestic service is still the infant of th[e] electric supply business.

The fifth point on our curve ma[y] necessarily be plotted with the help [of] imagination. But if history gives any [in]dication of what to expect, it will [be] imagination that will spot that point hig[h] and then reach.

Ontario Hydro Turns to Ottawa River for Power

THE *Hydro News* published by [the] Hydro Electric Power Commissi[on] of Ontario reports in its March iss[ue] that "(The Ontario) Hydro, which w[as] committed to proceed with the St. La[w]rence development as soon as the agr[ee]ment was implemented, was unable t[o] embark upon any major undertaki[ng] until that situation became clarifi[ed]. When it became evident last year th[at] no immediate action would be taken [to] go ahead with the St. Lawrence, [the] (Hydro) Commission turned to the O[t]tawa River.

"Here, an agreement has been reach[ed] which will enable Ontario and Que[bec] to share almost equally in the develo[p]ment of important new power resour[ces] aggregating 850,000 continuous hor[se] power at seven sites along the int[er]provincial section of the river.

"Ratified by the Ontario Legislat[ure] and now awaiting ratification by Que[bec] and the Dominion Government, [the] agreement is one of far reaching [sig]nificance, both from the long term pow[er] development point of view and from [the] short term war power point of view."

Report Shows Both Customer and Company Approval of Meter Reading and Billing Changes

THE material in this article is taken from a report on Emergency Changes in Customer Accounting, Collection and Customer Relations Procedures, prepared jointly by the Customer Activities Group of the AGA and EEI, the respective chairmen being Messrs. E. F. Embree, the New Haven Gas Co., and H. R. Flanegan, Philadelphia Electric Co. The report was presented at the Cincinnati meeting of Electric and Gas Industry Accountants, April 27-28, and is based on a comprehensive summary of replies to a questionnaire circulated some weeks ago to a cross-section of the electric and gas industry on a country-wide basis.

The report is in three sections covering (a) Customer Accounting—Meter Reading and Billing Changes, (b) Customer Collection—Methods and Experience and (c) Customer Relations and Reactions to the New Procedure. This resumé presents some of the more interesting findings of the report, omitting through lack of space a considerable amount of detailed information and comment from the companies.

At the outset it may be said that 67 companies reported favorable acceptance of the new billing plans, four companies fair, and only one company reported what may be considered poor reception.

METER READING AND BILLING CHANGES

A total of 89 companies replied to the questionnaire, 74 companies having made meter reading and billing changes and 15 companies having made no changes. Of this latter group, several are contemplating making changes in the near future.

Twenty-one companies changed during the first six months of 1942; 39 during the last six months of 1942; and 13 during 1943 up to and including March 1.

Types of Plan

The types of plan adopted and a few of the reasons given for the adoption of the chosen plan in preference to alternative plans are as follows:

Five Companies Adopted Bi-Monthly Reading and Billing

"Bi-monthly indexing and billing was selected for its over-all saving — because it does not require the training of additional personnel — because it will create a labor pool from which transfers may be made — because it does not require estimation of use with the consequent under and overstatement of sales — because it requires no change in billing equipment — because it entails no supplemental work — because it requires less personnel per 1000 accounts from indexing to collection."

1 Company Adopted Bi-Monthly Reading With Customer Card Reading in Non-Reading Month

(Applied to large power accounts only (not measured)).

25 Companies Adopted Quarterly Reading With Customer Card Reading in Non-Reading Months

"We selected this plan because it provided a maximum curtailment in the use of transportation equipment and yet provided a means for obtaining meter readings for rendering bills for actual use."

"It seemed to provide more savings of manpower and automotive equipment and required practically no change from our regular procedure. We are contemplating the adoption of quarterly meter reading with the averaging of bills in the non-reading months. Numerous customers have advised that they do not care to bother with the cards and have requested us to average their bills as we see fit. That fact and the lesser amount of work involved are the reasons we are contemplating the change."

"It is believed this particular plan offers the maximum reduction in car mileage with a minimum revision of reading, billing, and collection procedures. Consideration is being given, however, to estimating bills in the non-reading months with the customer option of providing card readings. Customer reaction to the plan is more favorable than anticipated. Car mileage has been greatly reduced but cost of handling cards is as much as previous meter reading expense."

"Proved to be best plan from company and customer standpoint by actual tests."

18 Companies Adopted Bi-Monthly Reading With Estimated Bills in the Non-Reading Months

"We consider it essential that customers receive a bill each month. Our operations are small and the bi-monthly plan was feasible with the help we have available; gives better control over our estimates in the intervening months, and the plan probably reduces complaints and bills are more easily understood."

"We adopted a plan of providing for monthly billing because we believed customers would object to paying larger amounts at long intervals and would have difficulty accumulating sufficient funds to pay a bi-monthly bill at one time. This would be particularly true among low income groups. Estimated rather than budget basis of rendering interim monthly bills was adopted because it involved least interference with established procedure of billing with the use of our equipment. Methods for billing on a budget basis, which seems preferable for other reasons, were subsequently devised, but have not been adopted because the Public Service Commission disapproved company's proposal to substitute 'budget billing' for 'estimated billing' method of rendering interim bills."

19 Companies Adopted Quarterly Reading With Estimated Bills in the Non-Reading Months

"Quarterly reading and monthly billing was adopted for the following reasons: (1) Saves more mileage than bi-monthly reading and accomplishes the desired results. (2) Postcards are furnished customers at their request but we prefer to estimate the consumption as we believe cards would not be returned regularly and their use would interfere with the proper operation of the billing department. (3) Quarterly reading and billing would tie up much more cash than the plan adopted."

"A quarterly reading plan with average bills in the two non-reading months was adopted because more manpower, tires and gasoline could be conserved and larger savings made in expenses. It was felt that customers were entitled to a monthly bill for approximately the same amounts paid formerly. Bills rendered on this basis (average use and amount) do not result in increasing revenues collected from customers, due to doubling or tripling the steps of rates where an 'amount only' is billed. All bills are prepared centrally. All bookkeeping operations are decentralized in district offices. In our situation, the plan adopted resulted in greater overall savings in billing and bookkeeping operations and had the further advantage of least disturbing existing procedures."

2 Companies Adopted Bi-Monthly Reading With Budget or Memo Billing (Money Only)

"Using bi-monthly plan rendering bill with money amount only for 'interim bill,' a saving is made as compared with estimating the readings and calculating an exact bill. We believe interim bills rendered on this basis are more readily accepted by the customer than if readings are estimated and if you record kilowatthours and amounts by classifications, etc., it does not seem they have any value for comparative purposes because they are estimated."

2 Companies Adopted Quarterly Reading With Budget or Memo Billing (Money Only)

"Several months' experience with quarterly billing with estimated interim billing in the rural areas indicated that while a reduction was accomplished in meter reading, no relief was afforded the billing department. In fact, it increased the personnel required due to estimating and necessary adjustments at the next reading date and did not reduce the work on the billing machines. Therefore, when the plan was extended to include urban areas it was changed from an estimated bill plan to budget or memo billing plan (money only). Monthly amounts are based on the average for a 12 months' period. The adoption of this latter plan has produced (1) A continuation of the savings in meter reading expense on a quarterly basis, (2) Reduced the work and the personnel in the billing

department by approximately 35%, (3) Reduced wear on billing machines and provided a reserve for future growth, (4) Slight increase in bookkeeping work in district office to handle payments of interim billing and applying them as credits to the quarterly bills. It is our belief that this plan affords the greatest amount of savings over any other plans which provide for continuance of monthly payments by the customers."

4 Companies Adopted Other Types of Plans Which in Most Cases Were Variations or Combinations of Plans Previously Listed

Coverage of Plan

Twenty-one companies applied their respective plan to cover the entire territory and 53 companies applied their plan only to specific areas consisting of rural and outlying territory.

The types of customers generally excluded from the change and the number of companies involved were as follows:

	Companies
Industrial and large commercial, including measured demands	61
Commercial accounts (not measured) using over 3000 kilowatthours per month	2
Industrial and commercial over $15 per month	1
All gas accounts	3
Gas accounts over $100 per month	1
Gas accounts using 20 MCF or over per month	1
Gas accounts using over 25 MCF per month	1
All house heating accounts	11

Estimated Bills

The method followed in estimating bills in general follows the plan of using previous month and same month last year adjusted for trend in use.

Where budget or memo billing is in effect two companies bill one-half the previous bi-monthly bill and two companies establish a monthly amount based on the previous 12 months' use and is adjusted only for permanent change in the customer's use.

Twenty-two companies have adopted the plan of estimating house heating bills in the non-reading months. The plan followed is generally the degree day basis with a few minor variations.

Practically all companies indicate that a bill has been estimated by one of the following methods:

	Companies
Additional symbol on billing or addressograph machine	22
Attaching a sticker	4
Rubber stamp	34
Other methods such as printed notation "Interim Bill," special postcard bill form, etc.	4

Postcard Readings

Twenty-six companies adopted plans which provide for customer card readings in the non-reading months. It is observed, however, that all of these plans cover rural or limited areas and in no case has the card plan been extended to cover the entire territory served by a company. The returns vary from a low of 65 per cent to a high of 93 per cent.

Most of the companies on the estimated bill plan allow the customer the option of furnishing a card reading in the non-reading month. In these cases cards are given out ranging from one at a time to a year's supply. The returns are usually about 90 per cent of those given out.

Cards left by meter readers which are used for billing purpose or verification of estimated bills result in approximately a 50 per cent return.

Employment of Women

Nineteen companies reported using women for meter reading; 10 for bill deliveries; and two for collections.

Reduction in Reports

Several companies commented on reduction in reports as follows:

"Simplified revenue accounting by eliminating separate system classification. Eliminated zone analysis of billing by rate schedules. Installed condensed and simplified merchandise and sales promotion accounting classifications."

"Eliminated the compiling of special reports showing kilowatthours, amount of earnings, etc., by rates, blocks or rates, etc. This information still available in the records and could easily be compiled if and when needed."

"Discontinued all rate and revenue reports except as required by Federal Power Commission."

"Revision of sales analysis reports, to eliminate certain statistical data formerly reported."

"Discontinued reporting revenues under each rate schedule, subdivided by revenue accounts. (Result of revised operating report.)"

Seven companies adopted postcard bill to replace standard bill, thereby eliminating hand bill delivery.

Training Programs

Twelve companies indicated that they had in operation a formal training program. A brief description of the respective plans follow:

"On-the-job training by supervisors and experienced personnel. Rotation of jobs to increase flexibility of organization and simplify adjustments in case of turn-over."

"Employ six to eight girls and train as a class for three weeks, covering rates, revenue analysis, register sheet plan, and account number system."

"Job training classes are conducted for billing, bookkeeping, and customer contact employees. The results of this training program have been very satisfactory. Girls 16 and 17 years of age, without any previous business experience, have within a period of 2 or 3 weeks been able to perform their work satisfactorily."

"Program being developed. At present experience training program schedules employees to work in other departments become acquainted with methods, etc."

"New clerical employees are given a course of instruction under the direction of the supervisor. Manuals of instruction cover the performance of the various operations are used for this work. Also each new public contact office employee is given a course instruction covering the operations in various groups of the Customer Accounts Division."

"Public contact training program carried on each year in addition to some training."

"20 female employees being trained for future use in clerical positions, such as punch operators."

"Program based on 'Training Within Industry' formula, with changes suitable work."

"Station Plan of Bookkeeping provides training new employees for the next higher job within the station. Also, optional training courses covering Commercial Department procedure available through the Educational Department. In addition, there has been instituted a plan of 'Supervisory Training'."

"New employees start in the Addressograph Division and as soon as they have been taught this work they are trained individually to the other routines in the Billing and Credit and Collection Departments. From experience, we find this method advantageous to us."

"Periodical group meetings of approximately one hour each."

"Personnel Department conducts monthly meetings. Employee Information Program at which various matters of interest to employees are discussed, including customer relations, as affected by attitude of accounting employees."

CUSTOMER RELATIONS AND REACTIONS

The questionnaire included several questions about customer relations and reactions to the changes. The replies to these questions are summarized herein. One point about the customer relations aspect which the committee emphasized as of special interest is this: *those companies that indicated the reasons for the adoption of their particular meter reading and billing plan in preference to alternative plans, most of them indicated that they had considered the customer viewpoint of primary importance.* Not only did they consider customers' probable readiness to accept changes in these times and the general agreed-to customer preference for monthly payments for utility service, but also there was concern for that intangible thing, "the effect on customer relations."

Typical comments along this line from the questionnaires are:

"Thought our customers would prefer plan adopted."

"Least effect on customer relations."

"Proved to be the best plan from the customer standpoint."

"Does not disturb customer relations as much as other plans."

ustomer Acceptance of Changes in illing Plans

Seventy-four companies reported anges in billing plans. Of this number 2 reported upon customer acceptance. f the 72 companies reporting customer eaction, 67 reported "favorable," four eported "fair," and one reported "poor." wo companies indicated that changes re too recent to permit gaging customer eaction. "Not in force long enough for ny customer reaction," reports one company; "we expect favorable acceptance," tates the other.

The company reporting poor acceptance based its conclusion upon the umber of complaints about estimated ills, and it is not clearly indicated that is company's experience is substantially orse than other companies who reported experiences as "fair," or even favorable." Likewise, the reasons for onsidering acceptance "fair" or "favorable" are not clearly indicated in the reies. Naturally, the judgment of customer acceptance is largely a matter of pinion. There is overwhelming evidence that the industry-wide changes in illing practice are being made without art to customer relations.

Opinions about customer acceptance re based on a variety of reasons, from he types of inquiries and the fewness of omplaints, to the cooperation in returning post card readings and the promptess of bill payment. These and other easons for conclusions about customer cceptance are indicated in the following xcerpts:

"The small number of inquiries received, few requests for meter reading postal rds, the nature of the inquiries, and the all percentage of adjustments or cancellaons, indicate a very favorable customer ceptance of estimated bills."

"Customers were gasoline and rubber conrvation conscious, and in some instances quired about a change in plan before it as instituted."

"Invariably, upon customer inquiry, they e satisfied as to our problem when exained. Percent of inquiries received not reat."

"Very few complaints; high percentage in turn of cards; no marked increase in dequency."

"Customers realize that the reduction in e of transportation equipment is a conbution to the war effort."

"Because it has been explained as an ential war measure."

"Relatively few complaints and questions at resulted. Very favorable collection reits and high number of bills paid in full."

"Customers' acceptance favorable due to ir desire to participate in our program conserve gasoline and tires for the war ort."

"Considered only fair because of increase number of complaints and inquiries from stomers."

"Limited number of rejections and/or complaints with respect to estimated bills. It is believed our customers accepted the new billing basis as a logical result of war conditions, particularly since our program followed similar tire and gasoline conservation by dairy companies, department stores, and others."

Notification of Meter Reading and Billing Changes

To the question, "When making your change in meter reading and billing procedure did you notify your customers of the change?" All companies but three reported "yes," and their replies indicated that notification had been given customers in the following ways:

Notification By	*Companies Using*
Bill sticker	7
Bill insert	24
General letter	31
Special post card notice	4
Booklets	2
Use of newspaper advertising	28
Personal calls (instances of limited changes)	15

Note: The total exceeds the number of companies reporting changes because 14 companies reported two or more methods employed in notifying customers.

To the question, "What employees were notified of change in meter reading and billing procedure?" 62 company reported that customer activities employees only had been notified. Nine companies reported that all company employees had been notified, and three companies did not answer this question. The reporting companies indicated the following methods of notifying employees:

General bulletin	28
Employee meetings	25
Company meetings	4
Letter to employees	6

Seventeen companies did not indicate methods of employee notification, and a number of companies indicated two or more methods were employed.

Complaints on Bills

Two companies commented, appropriately enough, "We do not have 'complaints,' only 'inquiries'." To the question, "Has there been a noticeable increase in complaints on bills (not on billing plan) as a result of billing changes?" 48 answered "no"; 21 answered "yes"; one indicated a billing change too recent to permit answer; four did not answer.

The reasons for increased complaints in all cases included incorrect estimates of use of service. Seventeen of the companies indicating increased complaints stated the reason as under- or over-estimated use of service, while four companies stated that the increase was also due to complaints based on actual bills following estimated or memorandum bills.

To the question, "Have you made any change in your methods of handling high bill complaints?" 62 reported "no"; eight reported "yes"; and four did not answer this question. The changes indicated are:

"Field call on special cases only."

"Thorough investigations by meter reader."

"Attempt to settle complaints without field visit."

"Telephone and correspondence instead of field calls."

"Customers asked to call at office for bill explanation."

"Improved scheduling of field visits."

"Practically all complaints handled by correspondence."

Employee Training

Only a few of the reporting companies indicated any new training programs, and in some cases it was not indicated how these training programs were related, if at all, to changes in meter reading and billing methods. Seven of the reporting companies indicated new general educational programs, and four companies reporting indicated training courses for customer activities employees.

Note the following comments on this question taken from questionnaires:

"Contact employees are fully acquainted with details and problems of changed methods."

"A more frequent review of instructions with the new personnel has been found necessary."

"Job training courses are being held for new employees."

"Individual and group instruction is provided for accounting department employees."

What Is New in Operations Affecting Customer Relations

One question provided an opportunity for listing new practices and policies affecting customer relations, and there was a variety of such items reported. Replies to this question follow:

"We have curtailed free service, delayed action on turn-ons and turn-offs and other service calls, and we no longer have full-time collectors."

"Girls now replace men as contact clerks as the men are called to the armed services."

"Initiated a program to educate customers to replace fuses."

"Meter service connected or disconnected on a 24-hour basis; 12-hour basis previously. Extension of service lines has been strictly limited. Curtailed the replacing of electric fuses on customers' premises."

"Customers are not connected or disconnected as promptly as before on account of re-scheduling of work. Asking customers to replace their own fuses, but will replace for customer if requested."

"Contemplating instituting in limited areas leaving service hot for succeeding customer."

"Increase in permissible time limits for performing gas and electric customers' ser-

vice work, but retaining our usual prompt schedule for the following: refrigeration leaks or no refrigeration, when customer's lighting is seriously affected, emergency calls, including gas leaks, wires down, etc."

"Adopted a statement form to initiate collection action on cut-off accounts, thereby eliminating the writing of a letter and a reflection on the customer's credit standing."

"Arranged to have cashiers accept partial payments to permit customers to complete transaction in one contact."

"Arranged for improved routing of incoming telephone calls through the use of a manual of instruction and a more extensive training program."

"We are leaving electric meters connected in outlying districts, attaching a card to the meter to be filled in and signed by the customer moving in. This card is mailed to our office and cut-in meter order is issued putting the meter in active service again. Services on customers' premises have been greatly curtailed and except in emergency they are taken care of when we are in that area rather than by a special trip. Evidences of this curtailment on all classes of service is that our automobile mileage in 1942 was reduced 45 per cent (650,000 miles) as compared with 1941."

"New skip-read billing notice card left by meter readers to notify customers that bill will be estimated."

"Switch tag left by serviceman or meter readers on disconnected services to inform customer that service is available and that office should be notified when use commences."

"Various mailing pieces explaining need for scheduling of service calls and dial-card meter reading. Others telling how to replace fuses and how to diagnose and correct minor causes of service interruptions."

"Showing of civilian defense motion pictures to clubs and other groups."

"Publicity regarding use and conservation of appliances."

"Assistance in placing of war subcontracts within territory."

"Holding of nutrition classes and meetings."

"Assistance in compliance with blackout and dimout regulations."

"Discontinued sending approximately 90 per cent of cut-out notices. When customer vacates premises, switch pulled and tag left on switch, or at convenient location, advising new occupant to close switch to secure service. Appropriate message printed on tag to welcome the new customer. Pooled service calls."

"Service work is now scheduled so that all requests for service in each locality are handled on the same day of the week in order to save tires and gasoline."

"Territory salesmen converted to home service representatives making minor appliance repairs and adjustments and rendering other services on customer premises."

CUSTOMER COLLECTIONS

Seventy-eight of the 89 companies replying to the questionnaire reported on the various questions relative to customer collections. These questions covered changes in consumer deposits policies, collection policies and personnel, delinquent and uncollectable bill accounts, and the follow-up of final bills; also such items as the collection and disconnection treatment of estimated or memo bills, the use of outside agencies for customers' convenience in the payment of bills and collection of final bills, the use of women for collections, training programs for collection employees, the short-cuts and economies made in collection routines and related work.

Twenty-two companies reported changes in their consumer deposit policies and 38 in collection policies. Of 34 companies that answered the question on changes in collection personnel, practically all reported a decrease in number of collectors.

The change in the status of delinquent accounts because of changes in collection policies and personnel summarized from the 67 replies to that question shows:

Increases	4
Decreases	29
No Change	27
Not Able to Tell Yet	7

Fifty-one companies reported, with no qualifying remarks, that estimated or memo bills are given the same collection treatment as actual reading bills. Thirty companies reported that service is disconnected on unpaid estimated or memo bills, 11 companies making certain qualifications.

Seventy companies reported that outside agencies are used for customers' convenience in the payment of bills. Fourteen per cent of these companies h increased the number of such agen because of changes in policy and per nel.

Eleven companies reported change the follow-up of final bills.

Forty-eight companies reported the of outside collection agencies for c lection of final bills after regular tre ment, 16 companies turning these counts over *prior* to charging off and *after* charging off.

Five companies reported that un lectible bills had increased because changes in policy and personnel; 32 they had decreased; 21, no changes; seven, not able to tell yet.

Two companies reported that are n using women for collections.

Fifteen companies stated they h training programs for collection emp ees, the general methods including features as group meetings, trai manuals, special customer relations sions, on-the-job training by supervis regular classes during or after w hours and general employee informa programs.

Thirty-eight companies report changes, short-cuts, or economies m in collection routines and related w because of war conditions.

Economic Laws Govern TVA as Well as Othe

THE following table shows the trend of the use of electricity by the residential customers of the 10 oldest TVA systems. This gives the average monthly consumption at the end of each year after beginning TVA service. It will be noted that, after the fourth or fifth year, the momentum of the enthusiasm has died down and most of the curves begin to drift downward again. The maximum levels are far below those which some partisans predicted as the immediate and automatic result of the TVA rate structure. When the orig rates were discussed, it was stated the "normal use" of electricity was s 3000 kwhr per year, or 250 per mo

The table also indicates that so thing more than cheap rates is neces to create and maintain a large consu tion of electricity. All these places h had substantially the same rates ye the end of the eighth year, the aver monthly use of current ranged fro to 176—a variation of over 100 per c

KILOWATT HOURS PER MONTH PER RESIDENTIAL CUSTOMER
10 Oldest Towns With TVA Service

	Years After Beginning TVA Service							
System	1('35)	2('36)	3('37)	4('38)	5('39)	6('40)	7('41)	8('42)
Tupelo	90	125	155	168	164	170	160	15
Athens	91	132	140	148	150	151	155	15
Alcorn County	76	117	140	153	163	173	178	17
Pontotoc County	55	73	87	101	107	90	87	9
Prentiss County	72	101	116	139	141	139	133	12
Tishomingo County	48	86	112	117	111	99	99	9
Tombigbee County	52	65	73	78	79	83	83	8
Amory	49	71	80	91	96	97	97	10
Pulaski	74	109	126	151	147	138	138	13
New Albany	69	82	93	109	117	126	122	12
Arith. Average	68	96	112	126	128	127	125	12

Source: Monthly Statistical Bulletin of the TVA.

Thomas A. Edison's Influence on the United States Navy

By Rear Admiral H. G. Bowen, U.S.N.

Office of the Under Secretary of the Navy, Navy Department, Washington, D. C.

An address on the Occasion of the Edison Pioneers' Twenty-Sixth Annual Luncheon and Twenty-Fifth Annual Meeting, February 11, 1943, New York, N. Y.

DURING the last war the Navy Department was particularly fortunate in being able to enlist the services of Thomas A. Edison. Research laboratories, at that time, were not only few and far between, they were relatively small and not too consequential. We had not yet realized the important function they were to play later in the remarkable industrial development which came in the twenties and thirties.

On coming to Washington, Edison was made chairman of the Naval Consulting Board. This board reported directly to the Secretary of the Navy the Honorable Josephus Daniels, who was sympathetic to its deliberations and its handling of inventions. The report of this board makes very interesting reading today. In regard to research, engineering developments, testing and inventions, its problems were not unlike those of the present, though, thanks to the great inventor and what he did, we are in a far better way to realize our aims now than we were then.

Establishing Naval Research Laboratory

One of the most important accomplishments of the Naval Consulting Board was its decision to establish a Naval Research Laboratory. Realizing the undesirability of starting an activity which could not possibly contribute to the war then in progress the Naval Research Laboratory was not founded until 1921. Upon its establishment a wise remark of the Naval Consulting Board was, I quote: "The great virtue of the Naval Research Laboratory lies in the fact that there will be developed during peacetime a corps of technically trained men who will be familiar with Naval affairs and the state of development of the arts used in warfare whenever war might occur. They will be able to direct their attention and that of civilian experts in the operation of war devices. The technical personnel of the Naval Research Laboratory will be the nucleus for mobilization of scientists for war" unquote. In 1917-18 there was relatively little research going on in this country and it must be said that it played a very small part as far as the fortunes of the United States were concerned. The research situation in Germany at that time was entirely different. The Allies were very much impressed by the progress of organized research in Germany and subsequently profited by the German demonstration of how it could be developed.

In the United States and Great Britain commercial research followed different lines than it did in Germany due to certain intrinsic differences which existed in the two countries. In this country we have a tremendous domestic consumption which not only warrants but supports mass production.

One of the most important by-products of mass production is the commercial research laboratory. The rise of these great commercial laboratories has been truly phenomenal since the last war and they have wielded tremendous influence in the scientific, the commercial and the economic fields.

The commercial research laboratory undoubtedly represents for the first time in history that an art can be self-supporting. The great progress of engineering in the United States has been due to its commercial research laboratories. They, and industry, working together have been responsible for placing more men at work than any other agency, except perhaps the national government.

Great Britain, with a smaller population and domestic market, has never approximated the United States in the full utilization of mass production. Research there has been more often defined with manufacturers associations and Government-aided activities.

On July 2, 1923, the Naval Research Laboratory was formally opened.

Congress described its activities—and I quote, "for laboratory and research work on the subject of gun erosion, torpedo motive power, the gyroscope, submarine guns, protection against submarines, torpedo and mine attack, improvement in submarine attachments, improvements and development in submarine engines, storage batteries and propulsion, airplanes and aircraft, improvement in radio installations and such other necessary work for the benefit of the Government service, including the construction, equipment and operation of the laboratory and the employment of scientific civilian assistants as may become necessary" unquote. Although some of the above-enumerated functions are now prosecuted in specialized laboratories under the cognizance of various Naval bureaus, much purely scientific work is done at the Naval Research Laboratory.

Research Progress

Prior to this time, research in the Navy, principally restricted to radio development, was performed at the Bureau of Standards under a group financed by the Navy Department, and at various other laboratories under the cognizance of the Navy Department.

During all this period from 1918 to 1941, the Navy maintained, and as a matter of fact still maintains, the closest contacts with the commercial research laboratories. The fact that the Navy found itself technologically in such splendid condition at the outbreak of war in 1941 reflects great credit on industry, on the commercial research laboratories, on the Naval Research Laboratory, and those of the Navy who were so eager to embody in Naval warfare the best products of industry and the products of industry's best intelligence.

High pressure and high temperature steam covers a large and widespread development with an interesting historical background. Prior to 1933 the design of the machinery for Naval vessels was pretty much in the hands of the so-called ship and engine builders with licenses from Parsons, Ltd.

You will remember that when James Watt put a condenser on the steam en-

gine, steam engines were quite universally used for pumping mines. It was Watt's invention or development which sent the steam engine to sea. From the time of Fulton on, for a great many years, the scientific development in steam engineering was to be found on Naval or commercial vessels. In other words, marine engineering led the steam engineering field.

Marine Engineering Inspired by Central Power Plant Development

With the invention of the Parsons and the Curtis turbines, and with the beginning under Thomas A. Edison of the great central power plants for generating light and power, the situation gradually changed until the central power plant design dominated the field of steam engineering. Thus, it became apparent to those of us who were in charge of engineering design for the Navy that in our time at least, and perhaps for a long time to come, marine engineering must derive its inspiration from the central power plant. Central power plant performance was much more efficient than Naval steam plants and to effect improvements, pressures and temperature were raised to 600 lb and 850° F.

This was one of the wisest decisions ever made. The large American turbine manufacturers with their competent research and test facilities behind them were in a position to afford splendid support to the Navy. The effort to bring its engineering more in line with the phenomenal work which had been done in the central power plants of the United States in raising pressures and temperatures due to utilizing the great progress which had been made in metallurgy in this country was successful.

This decision naturally encountered much opposition from those who could not realize that we had passed a big turn in the road; that intense specialization was the order of the day; that we must greatly increase the fuel efficiency of our ships, which, of course, adds greatly to the cruising radius. With high pressure and high temperature came high-speed turbines. Fewer blades, double-reduction gears, improved feed-water systems, corresponding reduction in the oxygen content of feed water, super-heat control boilers, and many other engineering details resulted. To all of these radical improvements great contributions were made by that distinguished ship designer W. Francis Gibbs.

The development of flameproof cable is typical of the procedure which has happened literally thousands of times where the Navy Department goes to a group of manufacturers and asks them to create something which not only does not exist but is way beyond anything required in commerce and industry.

One of the great accomplishments of this period was the multi-engine Diesel electric drive for submarines. It has enabled us to build submarines vastly superior in performance and reliability to anything which had been produced before. It was developed by the manufacturers of the country and the Navy Department working in conjunction. One of its amazing by-products was the application of these engines to the locomotive, an application which, if my information from the newspapers is correct, has resulted in Diesel electric locomotives constituting half of the locomotives being built in this country at the present time.

Lightest Ocean-Duty Diesel

Recent press releases from the Navy Department announced the arrival of the General Motors Diesel engine for sub-chasers, described as the "lightest ocean-duty Diesel engine in the world" and the "best engine any sub-chaser ever had."

There is a very interesting story behind this announcement.

In July, 1937, I went with Commander Leggett to Detroit to inspect the pencil drawings of a new lightweight Diesel engine designed by C. F. Kettering at the General Motors Laboratories. Pencil drawings, that's all—no model—nothing else. Now at that time, there was no interest in this country in patrol boats, sub-chasers and any of those small craft, because the present war was too far away to permit any visualization of the future by most people—in or out of the Navy.

Well, the design looked good and in spite of lack of support, I decided to proceed with the development of this engine and to get myself into the position where I could put this engine on the shelf, ready for an emergency not as yet foreseen by others.

As a result of this meeting in Detroit, I put $250,000 of the Government's money into the development of this engine which at that time existed only on paper, no model having been built. General Motors put up the rest of the money. I was positive that Boss Kettering's dream was worth $250,000.

Now, here we have a good example of the field of the commercial research laboratory in the preparation of the Navy for a future war. The building of a radically new engine, revolutionary in space requirements and in weight per horsepower, was initiated before there was any demand for it and while some skeptics were saying it would never be of any use to anyone.

Well, this unwanted baby, conceived in 1937, arrived in 1942 to help us solve a submarine menace never dreamed of in 1937. But the engineers in 1937 were confident that this engine was destined to great future usefulness.

Another great piece of research work started years ago, was in radio detection. The details of this can not be told here at this time.

All work on this subject done anywhere stems from the original work of Dr. A. Hoyt Taylor. All the fundamental work done in this country must be credited to Dr. Taylor, Mr. L. A. Young, Mr. R. M. Page and other brilliant associates, all members of the Naval Research Laboratory. This Republic can never repay these geniuses for their outstanding contribution to the National Defense. Through their efforts and the efforts of other equally able men, the contributions of the Naval Research Laboratory in chemistry and underwater sound, to mention only a few subjects together with radio detection, have repaid the Government all cost of the Laboratory to date and would finance future expenses for an almost indefinite period.

Their development alone forever controverts the old saying that armies and navies never made any contribution to the Art of War.

I have given you several examples to show how long it takes for the product of research to become of general use.

All the developments in connection with the modern machinery of our Navy vessels were worked out by 1939, a long time before the public ever thought we would get into this war, before the present stupendous appropriations became available, and while we were still building a one-ocean Navy.

Developments Supported by Charles Edison

Incidentally, all of the developments in regard to high pressure and high temperature steam, flameproof cable and many other remarkable developments during this period enjoyed the hearty support of Thomas A. Edison's son, the Honorable Charles Edison, while he was Assistant Secretary of the Navy and Secretary of the Navy. There are those of us who can still remember the storm which was raised when Secretary Ed

first dared to suggest that this country might need a two-ocean navy, let alone a seven-ocean navy.

The groundwork for radio detection was prepared, well before the outbreak of war. The fact that we are making such rapid progress in developing it to its logical conclusion, the fact that we are building so many Naval vessels so rapidly, the fact that we have pancake engines in production today is due largely to research work done long before Pearl Harbor.

The public should know that the Army and Navy have not been asleep in regard to the prospects of research during the period between the two World Wars. It is indeed fortunate that Thomas A. Edison, the Honorable Josephus Daniels and the Congress foresaw the necessity for organized study of Naval problems, and that they established the Naval Research Laboratory. This Laboratory is indeed a reservoir for the accumulated scientific and technical experience of the Naval scientist so coordinated with Naval practice that the experience may be immediately applied to new and changing situations. During the past two years it has in fact been an important and experienced nucleus for the indoctrination of new investigators with the fundamental requirements of Naval research and has also provided a pool of information on the scientific aspects of many specialized Naval problems.

Of course, in time of peace there naturally is not expended the tremendous energy on any subject that is expended in time of war. Men are not available, money is not available, in like amounts, and sales resistance to new ideas is unbelievably high. It is 100 times as hard to put over a new idea in time of peace as it is in time of war.

But the time to lay the groundwork and to standardize engines and equipment is before the necessity for large production arises.

The Naval Research Laboratory is required to fill a large field in research, development, and consultation in connection with production, installation and operation. We can not research a product into being, turn it over to a production activity, and then wash our hands of it. As much as we would like to, we can not devote our time exclusively to research.

On account of long contact with industry and the Navy, our scientists are accustomed to build models that, first, are reasonably susceptible to production, and second, are practical to use aboard ship. That means, of course, that the Naval Research Laboratory model does not have to be entirely rebuilt by the manufacturer or contractor in order to so reduce its weight or its volume that it can be used aboard ship or in a plane, or in order to make it susceptible to modern shop methods of production. The Naval Research Laboratory not only furnishes consulting advice to the contractors in the case of its models, but for practically all similar models produced elsewhere.

After production, installation difficulties arise in the case of radically new and complicated installations. In this case we not only furnish consultation and do installation work, but also train installation engineers. We have had to educate and train operators and maintenance engineers. We assist in the formulation of new tactics which may have to be developed to meet realistic changes required to best embody new equipment in operation. These scientists fly in planes, cruise in surface ships, and dive in submarines.

Great Debt to Thomas A. Edison

The Naval Research Laboratory in its work has always enjoyed support from the Congress. The Naval Appropriations Committee of the House under the able chairmanship of the Honorable James G. Scrugham, has enthusiastically supported the Laboratory and supplemented its hearings by frequent and detailed inspections of the problems under way. This encouragement has been invaluable.

I must not forget to mention the National Inventors Council, which handles inventions for the Army and Navy, doing in this respect for both services what the Edison (Consulting) Board did for the Navy in the last war.

The Navy has been alive to all new ideas down through the years. Of course, if one could be definitely sure that a certain thing would happen in the future, that would permit different dispositions. No nation has ever been completely prepared for war—not even Germany, and wars are fought with what you've got, not something you wished you had.

Pancake engines, extraordinarily economical machinery, radio detectors, etc., are not pulled out of a hat. It takes a lot of work and a lot of time, and if you are not well along with them when war breaks out—why, they don't fight in the current war.

You can be assured that this country is today by far better off technologically than it has ever been in any other war, and the Navy acknowledges with deep appreciation its great debt to Thomas A. Edison.

NEW EEI PUBLICATIONS

A-C NETWORK OPERATIONS 1938-1940

EEI Pub. K-4. A report of the Transmission and Distribution Committee, Edison Electric Institute. 38 pages. Price 60c to members and their employees; $1.50 to nonmembers in the U. S. A.; $1.65 to foreign countries.

SIXTY-NINE companies submitted data on operations of 253 networks in 145 localities which have been compiled and tabulated for the period 1938-1940, inclusive. These data have been summarized, compared with data of previous reports wherever possible, and analyzed, in general, on the bases of per cent of peak load supplied and per cent of reporting companies.

The peak load served by low voltage A-C networks in 1940 was 1,781,729 kva, an annual increase of nearly 9 per cent since 1937. The total installed transformer capacity in low voltage A-C networks in 1940 was 4,065,355 kva, also an annual increase of nearly 9 per cent since 1937.

The 120/208-volt, 3-phase, 4-wire is still the most widely used network system. An attempt was made in this report to detect some trend within the three voltage groups; 115/199 volt, 120/208 volt, and 125/216.5 volt, 3-phase, 4-wire. No definite conclusions can be made, although there seems to be some slight trend to a higher voltage.

The practice by companies of regularly checking the operation of automatic network protectors by opening station breakers has apparently detected faulty protectors before fault conditions occurred. The failure rate of protectors to open per 100 normal switching and testing operations was about 12 times the failure rate per 100 operations during fault, and compared to the 1937 report the failure rate for normal operations was doubled in 1940 whereas the failure rate for operations during fault was reduced to one-twelfth in 1940.

(*Continued on page* 140)

REVIEW AND CLASSIFICATION OF 121 FATAL ACCIDENTS WHICH OCCURRED IN 1941 IN THE ELECTRIC LIGHT AND POWER INDUSTRY

Edison Electric Institute—Accident Prevention Committee

(This summary was compiled by Mr. D. C. Stewart of the Accident Prevention Committee, April, 1942, from detailed reports submitted to the Institute. Coverage is approximately 90% of the 134 Fatalities indicated for 1941 by EEI Publication J-9, December, 1942.)

ELECTRIC SHOCK OR BURN 74.4%	LINE WORK ON POLES	CONTACTS ESTABLISHED WHILE CLIMBING OR IN WORKING POSITION NOT WITHOUT CUTTING OUT OR LOSING BALANCE	HANDS	120 Volts	Lineman	1.Passing blocks around sec. wires to man above. Contacted 120 V. wire, shocked.
				110-220	Lineman	2.Changing 2 wire to 3 wire service. Taping connectors on sec.wires. Elec. shock.
				115-230	Driver-Appr'ce Lineman	3.Making secondary tap with connector.Hand on connector,hip against neutral. Shock.
				440	Lineman	4.Preparing to attach blocks and clamp to uninsulated portion of wire. Shock.
				2300	Serviceman	5.Climbed ladder against lightning-shattered pole to work on primary.
				2300	Lineman	6.Replacing broken insulator pin. Grasped guy in contact with primary.
				2300	Lineman	7.Contacted phase wire. Details of job not stated on report.
				2,300	Lineman	8.Connecting new customer. Grasped 2300 V wire instead of 110 V.
				2300	Lineman	9.Completed changing taps on transformer. Bare hand contacted terminal of cutout.
				2300	Lineman	10.Installing cross arm on transformer pole. Contacted primary with left hand.
				2300	Lineman	11.Sitting on transformer. Reached for cross arm. Touched primary instead.
				4,500	Lineman	12.Applying line hose. Contacted live street lighting circuit hand to hand.
				4,600	Lineman	13.Relocating racks and extending service. Inserting spools in secondary rack.
				4,800	Appr'ce Lineman	14.Contacted 4800 V. primary without gloves. No further details given.
				6,600	Lineman	15.Removing transformer. While pushing case it contacted primary.
				12,000	Lineman	16.Placed fuse against terminal of cutout. Alive because of "backward" hook-up.
				Not given	Lineman	17.Connecting ground side of lightning arrester, hand contacted primary.
			HEAD OR BODY	1330-2300	Lineman	18.Job completed on 2 pole structure. Crawled under live circuit.
				2300	Troubleman	19.Removing lightning arrester bracket, head contacted primary.
				2300	Lineman	20.Tying in jumpers to pin insulators. Shoulder contacted conductor.
				2400-4160	Lineman	21.Tying conductor to insulator.Leg between 2 sets of secondaries',shoulder touched pri.
				2400-4160	Lineman	22.Contacted sec. energized thru man's body as described in 21. Threw him against pri.
				6600	Lineman-Serviceman	23.Closing switch on farm line just repaired. Shoulder against primary.
				6900	Serviceman	24.Disconnecting sec. transformer leads. Neck contacted primary. Death from burns.
				11,000	Lineman	25.Foot slipped from lineman's platform. Head struck 11 K.V. line, foot on guy.
				11,000	Lineman	26.See 25. Working below other man contacted him. Death from burns.
				12,000	Power Meterman	27.Mounting current transf. Contacted cutout trying to catch tape thrown to him.
				12,000	Lineman	28.Standing on improvised platform 5-1/2 ft. below 11 K.V. Made contact.
				12,350	Lineman	29.Transferring wires from old to new pole. Head contacted hanging series lead.
				60,000	Lineman	30.Wiping insulators, 2 circuit 60 K.V. line, 1 line hot. Contacted loop of live line.
			ARMS	110-220	Lineman	31.Placing safety around pole. Wet shirt sleeve contacted secondary. Death from fall.
				120-240	Local Manager	32.Sagging new secondary span wire, contacted 120 V. above glove. Electric shock.
				2,300	Lineman	33.Fastening jumper on primary. Contact inner side of arm above rubber sleeve.
				6900	Lineman	34.Had connected cutout when his arm contacted arrester metal hood above glove.
		GAFF CUTOUTS LEADING TO SHOCK OR BURNS		2,300	Lineman	35.Cutting new street light into circuit. Cutout and fell into hot wire.
				6600-11,000	Lineman	36.Transferring wire which shorted. Man cutout and fell into phase wire.
				6900	Lineman	37.Repairing arc circuit. Cut out or lost balance contacted 6900 V. wire.
				8,000	Lineman	38.Connecting ground jumper neutral to overhead guy. Cutout, contacted 6 K.V.
				66,000	Lineman	39.Reaching for "hot" line tool on wire; cutout, grasped tool near wire. Fatal burns.
		SLIP OR LOSS OF BALANCE		2300-4000	Lineman	40.Preparing to insert insulators in secondary; attention diverted, touched primary.
				4800	Lineman	41.Standing on arm after taping joint. Lost footing, contacting primary.
				6900	Lineman	42.Covering hot transformer riser with blanket. Lost balance. Death from burns.
		"DEAD" LINE		6900	Lineman	43.Grounding line thought to be dead, created short circuit. Death from burns.
		MISC. NOT CLASSIFIED ABOVE BECAUSE OF INSUFFICIENT DATA		110	Lineman	44.Secondary work. Collapsed. Shock by no means certain, only bare possibility.
				120-208	Electric Mechanic	45.Connecting 4 conductor cable to single conductor. Making phasing test. Shocked.
				110-220	Lineman	46.Dead ending hard drawn bare secondary on rack.Contacted secondary receiving shock.
				230	Lineman	47.Connecting new service drop to secondary at rack when he received electric shock.
				2300	Lineman	48.Climbed pole for unknown reason and without instructions. Made contact.
				4,600	Lineman	49.Repairing damage following transformer fire. Contacted primary.
				6900	Lineman	50.Changing cross arm - no other details given.
				6900	Troubleman	51.While clearing line, shock from 6900. No other details given.
				Not given	Lineman	52.On pole. "Shocked but it was not determined exactly how."
	LINE WORK BUT STANDING ON SURFACE OF GROUND	ENERGIZED LINE WIRES		110-220	Not stated	53.On trouble patrol during storm, became entangled with live wires on ground.
				2,300	Groundman	54.Pulling up tel. wire with truck.Wire contacted 2300 V.line. 4 shocked, 1 fatally.
				6900	Laborer	55.Splicing wire on ground after storm. Line became energized.
				11,000	Truck Driver	56.Tending reel. Tel. wires being strung flipped from tree into 11 K.V. circuit.
				11,000	Lineman	57.Pulling sec.wires by hand under 11 K.V.Flipped loose from barb on fence into 11 KV.
				11,000	Lineman	58.See 57. Triple fatality.
				11,000	Lineman	59.See 57. Triple fatality.
				13,000	Laborer	60.Wires being strung entangled in brush. One wire contacted 13 K.V. line.
				44,000	Truck Driver	61.Pulling dist'n wire by hand under 44 K.V. Flipped up, 4 shocked, 1 fatally.
		GUYS OR STEEL CABLES		2300-4000	Lineman Helper	62.Loading transformer. Steel line contacted lightning arrester, energizing trans.
				6900	Lineman	63.Pulling slack out of guy wire. It contacted 6900 volt wire.
		ENERGIZED TRUCK BODY		2300	Groundman	64.Setting pole. Truck cable or boom contacted primary. Man touching truck.
				8000	Groundman	65.Same accident as 66. Man touched truck energized through winch line.
		POLE CONTACT		8000	Lineman	66.Setting pole with ground wire on it near hot line. Man guiding pole butt shocked.
	LINE WORK IN TREES			1300-2300	Lineman	67.Climbed extension ladder to clear primary and secondary burning in tree.
				6600-11,000	Tree Trimmer	68.Grasped too close to metal head of tree trimmer hanging on line.
				7620-13,000	Tree Trimmer	69.Limb he had just cut off blew into line and against his head and shoulder.
	LINE WORK AT BUILDING			2800-4800	Lineman	70.Installing ground wire at building when it contacted primary 1 span away.
	AT STATIONS WORKING ON OR AROUND EQUIPMENT BUS STRUCTURES ETC.	ENERGIZED BUSES		2300	Electrician	71.Preparing to paint wall near energized bus. Contacted live 4 K.V. bus.
				4,000	Electric Mechanic	72.Removing equipment from "dead" compartment, entered adjacent live one.
			6900	Lineman	73.Replacing lightning arrester. Touched steel rod of ladder rung contacting bus.
				23,000	Lineman	74.Cleaning blades of 23 KV. disc. Slipped on steel work,contacted bus and fell 16 ft.
				20,000-34,500	Electric Mechanic	75.Walking across steel beam on structure, contacted 34.5 KV. bus. Death from burns.
		ENERGIZED LEADS AND RISERS		6,900	Lineman-Serviceman	76.Climbed 7 ft. on ladder to watch fellow workman. Contacted 6900 V. lead.
			6900	Temporary Laborer	77.On own initiative climbed structure and pulled up electric drill by rope.Shocked.
			7200-12,500	Electrician's Helper	78.Removing pot.trans. from dead breaker.Climbed ladder at another place. Fatal burns.
			13,000	Manager & Lineman	79.Failed to open 3rd disconnect to transf. bk. May have contacted 13 K.V. jumper.
			13,200	Sta. Maintenance	80.Cut 13.2 KV. lead with cutters before fellow employe opened disconnect.
		DISCONNECTS		2770-4800	Electrician	81.Painting bus structure from ladder,long handled brush. Fell against disconnect.
				7620-13,000	Wireman	82.Removing support, contacted live jaw of 13,000 V. disconnect. Fatal burns.
				13,200	Helpsman	83.Drop test cord through hole in floor. It contacted disconnect. Fatally burned.
		FUSE BOX		2736-4800	Lineman	84.Climbed structure, opened damaged fuse box. Contacted terminal with elbow.
		REACTOR		6900	Chief Sta. Operator	85.Inspecting reactor, pointed to it and made contact with thumb.
		LIGHTING ARR		13,200	Electrical Engineer	86.Checking arrester. Hand on arrester apron at time of discharge across gaps.
		UNCLASSIFIED		24,000	Electrician	87.While testing relays contacted 24 KV. No other details given. Death from burns.
	VOLTAGE TEST			440	General Foreman	88.Making voltage test, grasped 440 Volt wire presumed to be dead.
	WATER WORK			Not stated	Lineman	89.Installing demand meter; on removing wire placed body in series with circuit.
	"HOT" TOOL FRAME			440	Asst Foreman	90.Grasped electric Welder on bench. Handle was "hot" at 440 V.
FALLS EXCEPT THOSE LISTED IN OTHER CLASSIFICATIONS 9.1%	LINE WORK ON POLES OR LADDERS	GAFF CUTOUTS ON POLES			Lineman	91.Changing position on pole, had unfastened safety when he cut out and fell.
					Serviceman	92.Descending pole after testing street light circuit. Cut out and fell 20 feet
		LOSS OF BALANCE ON POLES			Serviceman	93.Climbing pole to run new service wires. Cut out and fell 16 ft. 3 inches.
					Lineman	94.Changing position after installing molding, fell backwards.
		POLE BROKE AT GROUND LINE			Lineman	95.Climbing pole and he either lost hand hold or fainted and fell backward.
					Electrician	96.Had sagged series wire and crossed to other side of pole. It fell throwing him.
		LADDER AGAINST HOUSE			Lineman	97.Safety attached. Cut loose number of wires. Pole broke. He fell with it.
	STEAM PLANT	BRIDGE CRANE			Hoisting Engineer	98.Releasing wires at house. Wire whipped thru bracket knocking him from ladder.
	HYDRO PLANT	SPLASH BOARDS ON FLUME			Dredge Operator	99.After inspecting motors of crane fell 45 ft. to coal pile below.
	SIDE WALK	ICY SURFACE			Collector	100.Removing splash boards on flume, fell into spillway and was drowned.
MOTOR VEHICLES 6.6%	RAILWAY CROSSING	STRUCK BY TRAIN			Truck Driver-Laborer	101.Water from window washing iced sidewalk. Broke ankle, pneumonia developed.
					Meterman	102.Drove truck in front of freight train travelling about 8 miles an hour
					Appliance Salesman	103.During stormy weather windows of car closed, struck by train.
		NO TRAIL INVOLVED			Mdse. Salesman	104.Calling on sales prospects car struck by freight train.
	ROAD INTERSECTION	COLLISION WITH			Meter Engineer	105.Crossing tracks. Lost control of car and it struck a pole.
		OTHER CAR			Meter & Serviceman	106.Driving car which collided with a truck at intersection.
	MAIN HIGHWAY	ON FOOT, STRUCK BY CAR			Truck Driver	107.Driving car which collided with other car at street intersection.
		COLLISION WITH OTHER CAR			Salesman	108.Truck partly on macadam, man standing by truck tool box was struck by car.
FALLING OR SLIDING OBJECTS 2.5%	LINE WORK ON GROUND	TRUCK WINCHES			Lineman	109.Struck by oncoming bus as he turned left on highway toward roadside stand.
					Lineman	110.Lifting 45' pole with derrick and winch. Winch failed, pole struck workman.
		LOAD OF POLES			Manager	111.Standing beneath truck A-frame sighting pole. Winch failed. A-frame struck him.
	STEAM PLANT	COAL PILE			Laborer	112.Unloading R.R.car of poles.Load shifted in unexpected direction rolling over him.
CAUGHT IN OR BETWEEN OBJECTS 2.5%	STEAM PLANT	VERTICAL SHAFTING			Oiler	113.Using pick to reclaim coal. Coal slide buried him up to face.
		COAL CONVEYOR			Coal Handler	114.Reaching for bucket beyond revolving shaft. Loose jumper caught.Thrown 51' below.
		ELEVATOR			Electrician	115.Working on coal conveyor before stopping. Caught between pulley and wall.
BURNED 1.7%	STEAM PLANT	BOILER FEED WATER			Maintenance Man	116.Taping connections on door switch. Elevator started. Cause unknown. Crushed.
		HOT CINDERS			Laborer	117.Opening flange in feed water line. Gauge showed 0. Spurt of hot water came out.
DROWNED .8%	STEAM PLANT	SAND BARGE			Boiler Repairman	118.In ash pit. Toggle tripped in unknown manner. Hot cinders burned him.
INFECTION .8%	PWR.HSE.YARD	WOODEN SLIVER			Camp Houseboy	119.On barge releasing driftwood. Barge broke loose, floated down stream. Drowned.
FUMES .8%	SUB STATION	GASEOUS FUMES			Electrician	120.Streptococcus infection from wood sliver in finger.
						121.Existing diseased condition aggravated by fire ext. liquid fumes.

Experience Points the Way in Accident Prevention

By D. C. Stewart

Member, Edison Electric Institute Accident Prevention Committee

BETWEEN 1926 and 1940 the Electric Light and Power Industry effected a reduction in its accident frequency rate of 76 per cent and a reduction in its severity rate of 67 per cent. These reductions are among the largest made by American industries, and all who participated in the effort are entitled to a share in the pride of achievement. The number of men whose lives might otherwise have been lost now runs into the thousands. These men are the living "unknown soldiers" of the industry, saved from accidental death because war has been persistently and successfully waged throughout the years against a stubborn, treacherous enemy—accidents.

But one fact is disquieting. For several years the Accident Prevention Committee has noted with concern the resistance of our statistical curves to further change on the downward side. Why are we currently making little or no progress? Are we really stalemated in the struggle? Are we finally contending with the economist's bogey, the law of diminishing returns? Is interest in accident prevention waning? Do we need some new, powerful stimulus to break through again to another sustained advance? These questions are not easily answered, but of one thing the Committee feels sure; we must first of all learn more about the industry's accidents, how they are happening, where they are happening and why they are happening. In accident prevention, as in other fields of human endeavor, knowledge of facts is a prerequisite to intelligent action. The Committee has made a start by studying fatal accidents.

As of April 15, 1943, the industry had responded to our request by submitting detailed reports on 121 fatal accidents which occurred in 1941. These accidents have been classified, tabulated and briefly described. The compilation appears on page 136, opposite. It would be difficult to overestimate the value of this basic data which permitted the compilation of the report, and the Committee desires to express its sincere appreciation to all who cooperated. Their generous help may indeed be the means of saving lives.

Dominating the list are electric shock or burn accidents, involving 74.4 per cent of all fatalities. Next come falls with 9.1 per cent and then automobile accidents with 6.6 per cent. Without discounting for a moment the importance of prevention work dealing with the causes of a single fatal accident, the principal problem hits us squarely and hard. Accidents associated with electric shock or burn claim most of the lives that are lost, and most of those accidents occur in connection with line work. However, line work can be done safely, as this fact is being demonstrated somewhere every day. Wherein, then, are we failing? Close study of these accidents may furnish a clue and offer hope of progress.

One cannot examine these reports without feeling that there is a point involved which is fundamental in any consideration of electrical accidents. It is this. If enough men, no matter how able and experienced they may be, over a long enough period of time assume positions with relation to unprotected energized parts, such that something unexpected (a fall, a slip, a cutout, a mental lapse, etc.) may result in an unprotected part of their bodies coming in contact with such parts, some of these men will eventually establish contact.

The wording of this statement can, of course, be changed to apply to any other type of hazard. But it is particularly significant when applied to electrical contacts because they tend to produce injuries of greater severity. If the statement is true, and the record seems to bear it out, then the way of prevention is clear. It lies in making sure, so far as is practicable, that the individual workman, no matter how experienced, capable or sure of himself he may be, does not assume such positions with relation to unprotected live parts.

There are simple measures to accomplish this, already well known to the industry. Correct position is of vital importance and will in itself prevent many accidents, but that alone is not enough. To protect themselves fully workmen should

1—always wear rubber gloves when within reach (including falling reach) of wires energized at primary voltages or wires which might become energized. Some companies require that rubber sleeves also be worn.

2—apply protective equipment to wires energized at primary voltages or to wires which might become energized when the workman is within reach (including falling reach) of such wires.

3—cover secondaries or other grounded objects as completely as is practicable when such wires or objects are so spaced with relation to primaries that the workman's body can bridge from secondary or other ground to primary.

The prevention of accidents should be a cooperative effort of executives, supervisors and employees. Everybody benefits if there are fewer accidents. But in the initiating or promoting of a safety program top management can supply a vital force for which there is no substitute. The power of active management participation probably lies in the fact that it releases for the cause of accident prevention more quickly and positively than can be released in any other way the latent energies and abilities that are inherent but perhaps not fully developed in all of us, supervisors and workmen alike. The average man will, consciously or unconsciously, budget his time and effort so as to give priority to those things he believes his superior wants most from him. If his superior places the prevention of accidents high on the list, so will he.

The tabulation provides the key to action. Every safety man, every engineer, every operating man will know how best to tackle the problem in his company. Concentrate on first things first—electric shock or burns (74.4 per cent of the total), line work—contact of hands, head or body and arms. Are these types

of accidents fully guarded against on your property? If your operating procedure, your safety instructions, your job training program, your foremen leadership and discipline are such that accidents to linemen working on poles cannot occur, pass on to the next largest group—electric shock or burn occurring to electricians or electrical mechanics, helpers, etc., doing work at stations on or around equipment, bus structures and the like.

Do not be deceived or lulled into a false sense of security by the fact that you have not had such accidents for a long time. Individual company experience may not be a reliable guide, more particularly where the man-hour exposure to these hazards is low, as in the smaller companies. A small group of men *may* in fact, through the sheer workings of chance, violate these safe practices over considerable periods of time without ill effect. The sword hangs suspended by a hair over their heads, but Fate may elect to pass them by for a time and strike instead within a group that works in the same manner half a continent away. The vital, searching question is not whether you have been free of all or most accidents such as these, but whether you are free of the unsafe practices which inflicted them on others.

One final point is offered for consideration. Electrical accidents tend to peak in the warm weather months of the year. Previous studies established that fact, and it is amply confirmed by the present analysis. Three out of four of the electrical fatalities of 1941 occurred in the middle six months of the year. We are now in this period. When shall we find a better time for action THAN NOW?

Electric Utilities Cooperating Effectively in National Nutrition Program, Report Shows

THAT electric utility companies are effectively cooperating with the National Nutrition Program is indicated by a report on Utility Coordination with the National Nutrition Program recently completed by the Home Service Committee of the Institute, Fern Snider, Chairman. The report supplements two earlier reports of the committee. The first prepared in February, 1942, was "A Guide to Home Service Activities in the Electric Utility Company," carrying recommendations of how the then functioning Home Service Departments could contribute the maximum in carrying on under wartime conditions.

This suggested Program was widely distributed to the major electrical utility companies operating throughout the country. Several months later the EEI Home Service Committee sent out a questionnaire to ascertain to what extent the Home Service Departments of utilities had switched to the wartime program. A selected group of utility Home Service Directors were asked to report to test results. One hundred per cent of the companies reporting indicated that they had been cooperating with the Red Cross and the National Nutrition Program and mentioned the many ways in which this cooperation was being carried on. The ideas offered by this group of Home Service Directors were included in a Supplemental Home Service Committee Report in August of 1942, "Adjusting Home Service Activities to Wartime Conditions." This report was likewise made available to the Home Service Directors of electrical utility companies as a guide in helping them carry on this wartime program more effectively.

As increased emphasis is placed on Nutrition, Conservation and Preservation of foods, the Committee decided that a further check should be made of some methods used by Home Service Departments in their participation with the Government program, and again a representative group were asked to submit outlines of their activities. The statements received from these companies indicate practically 100 per cent tie-in and are gratifying in the scope of effort revealed.

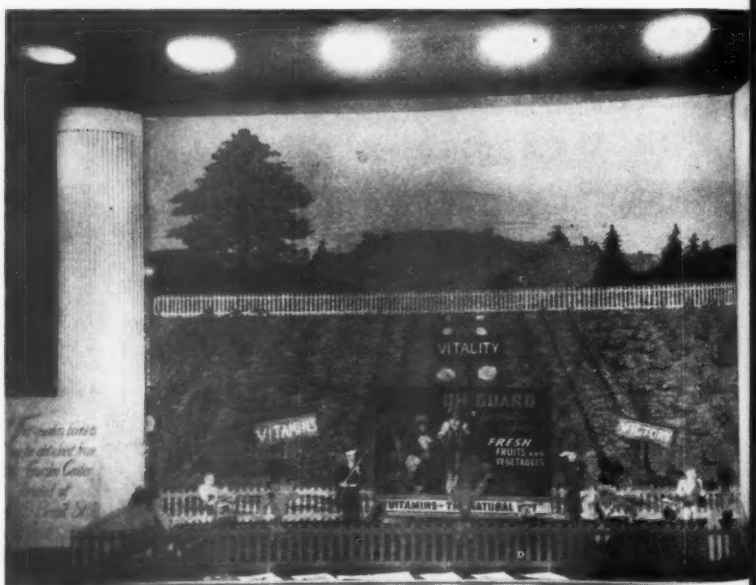
Briefly summarized, the present report shows that:

In utility offices and display floors now available because of the lack of merchandise, nutrition centers have been installed in which the public could secure advice on nutrition, meal planning and other timely food problems.

Utility companies have been instrumental in the organization of Health For Victory Clubs.

The utilities are utilizing radio time to reach a large listening audience in their

(*Continued on page* 156)



This Victory Garden Window Display was made possible at a cost of about $6.50 using the talents of Miss Sally Eberly, artist in the advertising department of Columbus and Southern Ohio Electric Company.

Stanley A. Dennis, Sales Promotion Manager of the company writes "In the foreground, on the floor in a fenced area, top soil was placed about 2 inches deep with the rows headed up with seed packet envelopes. Then, spotted throughout the soil are fourteen-inch robust figures in bright color to represent the different vitamins. The background, painted on newspaper stock in vivid color, depicts the larger type garden, showing in the background, pasture and grain fields. As the sign to the left indicates, the public could avail themselves of one or all of seven pamphlets displayed to the front of the window which are distributed by the local garden center."

Safety Merit Award Inaugurated

Five Companies Have Already Qualified for Outstanding Achievement Certificate

AWARD to five companies of the EEI Safety Merit Award for Outstanding Achievement in Accident Prevention has been authorized since the official announcement of the availability of the awards last month.

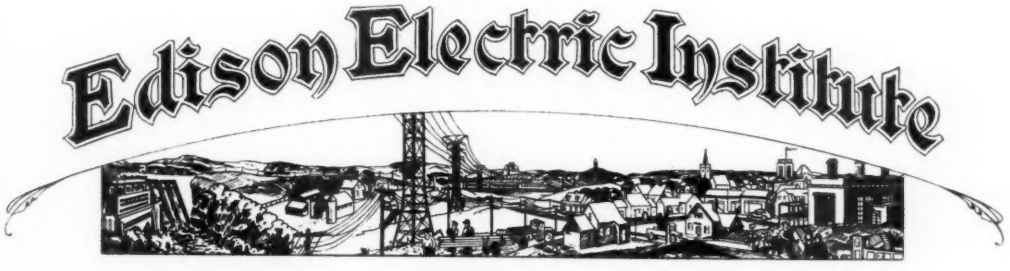
The companies so distinguished are the Appalachian Electric Power Company, Conowingo Power Company, Duquesne Light Company, Northern States Power Company and Public Service Electric and Gas Company of New Jersey. Four of the companies qualified for more than one certificate under the terms of the award, which is open to any EEI member corporate company or operating unit thereof whose employees have worked *one million or more consecutive manhours without disabling injury accident.*

The Award was proposed by E. J. Kreh of the Duquesne Light Company at the meeting of the Accident Prevention Committee held in New York in October, 1941. The plan was endorsed by the committee with the dual purpose of appropriately commemorating such organizations as had achieved outstanding results in accident prevention, and further encouraging accident prevention measures in company organizations and the practice of those by individuals. The proposal for the award was approved by the Operating Committee last June, and a preliminary announcement was made in the June, 1942, EEI Bulletin. Regulations governing the award were drawn and adopted, and the Certificate of Award designed and engraved.

The Certificate of Award is reproduced in reduced size on this page. The engraving at the top of the certificate has been designed especially to symbolize the many fields of activity necessary to the supply of electric service—broadly embraced in generation, transmission and distribution facilities—and to honor the many thousands of men and women hourly engaged in these activities and whose safety records these certificates will commemorate.

The official announcement of the Award was mailed to chief executives of member companies on April 9, and it is expected that within the next few weeks a number of additional applications for the award will be received.

Companies and subdivisions of companies that have already been awarded the Safety Merit Award are listed be-



low, together with their manhours safety record:

Appalachian Electric Power Co., Roanoke General Office, Roanoke, Va., Apr. 29, 1936, to Dec. 31, 1942—1,350,113¼ manhours.

Appalachian Electric Power Co., Roanoke Division, Roanoke, Va., Oct. 10, 1940, to Dec. 31, 1942—1,275,735¾ manhours.

Conowingo Power Co., Elkton, Md., Nov. 4, 1931, to Dec. 31, 1942—1,067,441 manhours.

Duquesne Light Co., Pittsburgh, Pa., Feb. 13, 1940, to June 12, 1940—2,154,988 manhours.

Duquesne Light Co., Pittsburgh, Pa., Feb. 7, 1941, to April 1, 1941—1,160,708 manhours.

Duquesne Light Co., Substations and Shops Dept., Pittsburgh, Pa., Sept. 24, 1940, to July 24, 1942—2,436,670 manhours.

Duquesne Light Co., Substations and Shops Dept., Meter Division, Pittsburgh, Pa., May 5, 1939, to July 24, 1942—1,001,237 manhours.

Duquesne Light Co., Power Stations Dept., Pittsburgh, Pa., Jan. 1, 1940, to Sept. 7, 1940—1,017,406 manhours.

Northern States Power Co., Sioux Falls Division, S. D., Mar. 30, 1939, to Dec. 31, 1942—1,747,947 manhours.

Northern States Power Co., Galena Division, Ill., Feb. 28, 1937, to Dec. 31, 1942—1,078,836 manhours.

Public Service Electric and Gas Co., Camden Electric Distribution—Camden Substation Group, Camden, N. J., Nov. 1, 1929, to Feb. 28, 1943—1,200,724 manhours.

Public Service Electric and Gas Co., Essex Electric Distribution, Meter Dept., Irvington, N. J., July 15, 1936, to Feb. 28, 1943—1,353,511 manhours.

Public Service Electric and Gas Company, Southern Division—Trenton area—Electric Distribution, Trenton, N. J., Sept. 1, 1939, to November 3, 1941—1,127,866 manhours.

Essential provisions of the regulations governing the award are as follows:

Any Edison Electric Institute member corporate company, or division or unit of a corporate company whose employees have worked 1,000,000 or more manhours without a disabling injury accident, upon presentation of the proper application, shall be awarded a certificate by the Institute, bearing the signature of its president, formally recognizing this achievement in accident prevention.

Application for Awards shall be made to the Secretary of the Accident Prevention Committee of the Edison Electric Institute, 420 Lexington Avenue, New York, on forms provided for that purpose by the Institute. (Copies of the complete regulations may be obtained from the same source.)

While Paragraph 6 of the regulations states that awards will be made at the annual meeting of the Institute, it is the present intention to make the awards as promptly as possible after the receipt and approval of applications.

Applications for awards may be made at any time during the year and may cover any period of time, provided there has been an accumulation of 1,000,000 or more consecutive manhours without a disabling injury accident.

No request for an award will be considered for any record which was broken or terminated by an accident occurring prior to Jan. 1, 1939.

Any member company or any unit or division of each company should include the record of hourly workers, office workers, and supervisors.

Manhours of exposure shall be the total number of manhours actually worked by all employees. This figure should preferably be calculated from payroll records. If such records are not available, the manhours exposure should be estimated upon the basis of the average number of employees and the average number of hours worked by each employee during the period covered by the application.

As was emphasized in the announcement of the Award's inauguration, the procedure for claiming the award and the process of examining applications and issuing certificates are all made as simple as possible, in order that none may be deterred from making a claim by reason of laborious preparation of exhibits and that no claim shall be delayed by excessive formalities, and yet that the awards shall have the dignity they merit. The only actual formality is final authentication by a permanent panel of judges nominated by our Accident Prevention Committee.

New EEI Publications

(*Continued from page* 135)

The failure rate of all secondary cables is about two failures per 100 mile years for the three-year period covered by this report. Fuses and limiters have operated in about one out of four cases protecting cables during fault. The failure rate of all transformers has dropped from about one per equivalent three-phase bank years in 1937 to about one-half in 1940.

The number of complete network outages has continued to increase each year and the outage rate per locality per year has increased from 0.35 to 0.43 or 1937 and 1940, respectively.

The conclusions arrived at in this report are, for the most part, based upon the experience of the larger companies, as companies with less than 15,000 kva installed transformer capacity were not requested to submit complete data as they represent only 6.4 per cent of the total installed transformer capacity. Direct comparisons with the data of previous reports therefore cannot be made without these qualifications: that there were changes made in the questionnaire, that only partial data was requested from small companies, and that there were changes in the companies reporting.

FURNACE TUBE CORROSION

EEI Pub. K-3. Final report of a Special Committee acting under instructions of the Boilers and Combustion Subcommittee of the Prime Movers Committee, Edison Electric Institute, 8 pages. Price 20c. to members and their employees; 50c. to non-members in the U.S.A.; 60c. to foreign countries.

THIS report covers the investigation made to determine the cause and remedy for the wastage of tubes occurring in many wet bottom furnace installations. It has been fairly well demonstrated that in the presence of a reducing atmosphere, wastage of metal from tubes may take place by the formation of compounds of relatively low melting points. Improvements in burner design and a continued maintenance of an oxidizing furnace atmosphere will naturally retard and probably completely inhibit corrosive attack.

EEI PUBLICATIONS

A catalog of all EEI publications is available upon request to

EDISON ELECTRIC INSTITUTE
420 Lexington Avenue, New York

Accounting Procedures Relating to War Facilities Covered by Necessity Certificates

By R. B. Carpenter

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A Paper Presented Before the Southeastern Electric Exchange Accounting Conference, Atlanta, Ga., April 9, 1943

THE subject Accounting Procedures relating to War Facilities Covered by Necessity Certificates is not only an important problem for accountants, but an interesting field of study. The problem, in this respect, confronting utility accountants is not as difficult as that confronting accountants for industrial enterprises. Generally speaking, the ratio of investments in war facilities to total plant investments of utilities is small as compared with that of industrial corporations where entire plants have been constructed or converted for war producton. Incidentally, utility accountants can also be thankful that they are not faced with the problem of determining profits under cost plus fee contracts, which determinations involve the treatment of amortization of plant facilities and accelerated depreciation.

An excellent paper on the subject "Amortization of Emergency Facilities for Tax Purposes" was presented before the Southeastern Electric Exchange on October 30, 1942. That discussion dealt with the provisions of the law with respect to amortization of war facilities, and outlined the advantages and disadvantages incident to an election to amortize such costs. In selecting the subject of this paper, it was evidently intended that this discussion should begin where the previous one ended. Therefore, for the purpose of this discussion, the assumption is that a company having an investment in war facilities, after a thorough consideration of the provisions of Section 124 of the Code and its incident advantages and disadvantages, has elected to amortize the cost of such facilities for tax purposes.

Accountants are often confronted with many problems that have not only the accounting, but also legal and economic aspects. This is particularly true of problems in taxation, and the subject for discussion is a typical example. This is especially true as it applies to a public utility corporation because of its various regulatory interests. Accounting, law, and economics are so closely inter-related in this subject that it is impossible to discuss an accounting treatment of the problem without venturing into the realms of law and economics, or financial management. Since the utility accountant is interested in a broad survey of this problem, the discussion might well be condensed under two main subdivisions.

Accounting Treatment—Tax Records and Returns

Accounting Treatment—Books, Reports and Statements

ACCOUNTING TREATMENT—TAX RECORDS AND RETURNS

Provision for the amortization of war facilities was made in Title III of the Second Revenue Act of 1940. The deduction is allowable in the computation of net income for both income and excess-profits tax purposes. In general, amortization is allowed in lieu of depreciation. Basically, amortization of war facilities is nothing more than accelerated depreciation, authorized for tax purposes in Section 124 of the Internal Revenue Code.

The purpose of the amortization provisions of the Revenue Act was to induce private capital to invest in war facilities and thus hold to a minimum the amount of Government funds needed for war production. It allows private enterprises to recover the cost of such projects over a period of sixty months or less—a shorter period than normally allowed for depreciation of plant equipment for tax purposes. Enterprises are thus permitted to recover their investments in war facilities in a relatively short period without incurring an offset to such recoveries in taxes.

One of the first considerations for the accountant is the determination of the costs to be amortized. The Code provides that the deduction allowed the taxpayer shall be the amortization of the adjusted basis of the war facility. The first step in determining the adjusted basis is the ascertainment of the unadjusted basis, or as it affects most companies here represented, the book cost. The following example will illustrate a simple computation of an adjustment of the basis of a facility:

Assume a utility completed the construction of a transmission line and substation to serve a war industry on July 1, 1941, at a total cost of $200,000, consisting of land $20,000, interest during construction $2,000, and other cost (depreciable property) $178,000. Election was made to begin amortization for tax purposes January 1, 1942.

Book Cost July 1, 1941	$200,000
Deduct Interest During Construction	2,000
Unadjusted Basis	$198,000
Deduct Depreciation July 1, 1941, to December 31, 1941, on Depreciable Property ($178,000)	3,000
Adjusted Basis January 1, 1942, Subject to Amortization	$195,000

In the above example, assume a partial retirement was made prior to the expiration of the five year amortization period. It would then be necessary to compute a new adjusted basis giving effect to the retirement as of the date of such retirement.

If after completion of the above facility, additional construction expenditures were made for additions to the same line and substation which were not included in the certificate, such expenditures may not be added to the adjusted basis for amortization purposes. Such additional expenditures, if properly certified as war facilities, may be covered by a new certificate and made the basis of amortization as a new facility.

A difficult problem is encountered in computing an adjusted basis for scrambled property. This occurs when an existing plant or facility is converted for war purposes, thus combining the use of some of the old plant and equipment with new plant and equipment acquired or constructed. In such cases the computation of the adjusted basis shall exclude the depreciated cost of the old plant and equipment. Utilities may be confronted with this problem to a minor extent by the use of materials in war

facilities that were transferred or salvaged from property in service. This would require a determination of the original cost and date of original installation of such materials and equipment in order to ascertain the depreciation previously claimed for tax purposes and thus compute the adjusted basis for amortization.

Another problem arises in computing the adjusted basis in cases where the customer advances a part or all of the costs of war facilities. Two methods of treatment of this problem were discussed in the paper presented to this conference October 30, 1942.

One method would permit the taxpayer to enter into a "closing agreement" with the Bureau of Internal Revenue, which would provide that the taxpayer may use as the basis of amortization the entire cost of the property after adjustment for depreciation allowed or allowable, but without giving effect to the amount advanced by the customer. This agreement must provide that, if for any reason the contract is terminated before the customer is reimbursed the total amount of the advance, the unrefunded balance is to be considered taxable income in the year in which his right to retain the same becomes absolute. This treatment creates no special problem in determining the adjusted basis, since the amount of the customer's advance does not enter into the computations.

Under the second or "alternative" method that may be used in determining the adjusted basis, the taxpayer would begin amortization with the total cost of the facility (adjusted basis) less the amount advanced by the customer, and increase the basis of the remaining property each time a repayment on the customer's advance occurred. This method, under contracts providing for a refund of a stipulated percentage of the power bills, would generally require a recomputation of the adjusted basis each month until the total amount of the advance had been repaid.

An interesting, but perhaps extreme, situation is possible whereby a customer advances an amount in excess of the total cost of the facility. Beginning amortization with the month following the date of completion of such facility would result in amortization of a starting negative cost. This difficulty may be overcome by beginning amortization on January 1 of the year following the date of completion instead of the month following date of completion; provided, of course, that repayments of the customer's advance during the intervening months from date of completion to January 1 of the following year were sufficient to reduce the advance to an amount less than the cost of the facility (adjusted basis).

In making a decision as to which of the two aforementioned methods to use in computing amortization, the question should be considered in the light of individual circumstances associated with each facility. In this connection, it was pointed out in the paper presented at the last meeting of this conference that the second or "alternative" method had not been expressly approved by the Bureau of Internal Revenue; that, in fact, the Bureau was inclined to look with disfavor upon the use of this method.

For facilities producing relatively high revenue in comparison with the amount of the customers' advances, where the terms of the contracts provide for repayments based upon a fixed percentage of the power bills, there are advantages in the selection of the "closing agreement" method. The hazard of exposure to high tax on possible unrefunded balance is lessened by the rapid rate of repayment, and the tax savings on this basis are spread uniformly over the period of amortization. Further, the use of this method avoids the necessity of a recomputation of the adjusted basis each time a repayment of the advance is made.

The second or "alternative" method would prove preferable for facilities where the amounts advanced by the customers are relatively large as compared with the rate at which repayments are to be made. Such repayments may extend over a period of several years, with the result that the emergency period may end prior to the complete liquidation of the advance. This would subject the taxpayer to what may prove a heavy tax on the unrefunded balance in the year in which it becomes his right to claim the same.

The terms of the contract, considered in conjunction with the characteristics of the war industry being served, the amount of the customer's advance, the revenue derived from the facility, and the progress of the war at the time of making the election should furnish a reasonably sound basis on which to make a decision as to whether to use the so-called "closing agreement" or "alternative" method in cases where a customer finances all or a part of the cost of the facility.

After having elected the amortization deduction, the taxpayer is given the option of terminating such deduction and claiming in lieu thereof a deduction for depreciation with respect to the remainder of the adjusted basis of the facility. This may be effected by notice to the Commissioner at any time prior to termination of the 60-month period. During the hearings before the Senate Committee on Finance, the Honorable John L. Sullivan, Assistant Secretary of the Treasury, made the following statement with respect to this provision of the Act: ". . . the reason why that provision is in there is that we anticipate that many of these plants may decide, after they have taken the 20 per cent a year for one or two years, that they are taking it too fast, and they will want to then go back to regular depreciation, and they are allowed to do that." The maze of uncertainty shrouding the future because of war conditions makes obvious the wisdom of the flexibility allowed in this provision of the law. After amortization has been terminated by a notice to the Commissioner, the taxpayer is not permitted to again elect to claim the amortization deduction with respect to the same facility except as hereinafter explained.

The Code further provides that if the President proclaims an end of the emergency period, or if the Secretary of War or the Secretary of Navy certify to the Commissioner of Internal Revenue that the facility ceased to be necessary in the interest of National Defense during the emergency, and such proclamation or certificate is made before the end of the 60-month period, the taxpayer may elect to recompute the amortization deduction on the basis of the period as terminated by the proclamation or certificate. The benefits of this election are permitted regardless of whether the taxpayer has previously elected the amortization deduction. The purpose of this provision is obvious. If a facility is of use only during the emergency period, fairness dictates that the taxpayer should be allowed to amortize the cost over the period of useful life of such facility.

Section 124 (b) of the Code was amended by adding a new paragraph (6) which permits amortization of partially completed facilities in the event of termination of the emergency period by either Presidential Proclamation or certificate by the Secretary of War or the Secretary of Navy. In such case the amortization period begins with the

month in which construction of the facility was begun and terminates as of the end of the month within which occurred the date on which the facility ceased to be necessary in the interest of National Defense.

Changes in the amortization period as a result of the aforementioned provisions of the Act would require recomputation of the adjusted basis for claimed depreciation or amortization, as the case may be. Such computations will require the adjustment of the original adjusted basis by the amount of the amortization or depreciation deduction that had been claimed to the date on which a change was made in the method to be followed.

The Act is silent as to the treatment of salvage value of war facilities at the end of the emergency period. The possibilities with respect to the use, conversion, abandonment and salvage of such equipment are too speculative to afford Congress a basis upon which to enact statutory provisions with respect to such allowances. In any event, the taxpayer will not be permitted to recover against income an amount in excess of 100 per cent of its investment in the emergency facility. If the total cost of the facility is recovered through amortization, no further deductions will be allowed for depreciation. Thus, if equipment used in an emergency facility, after being fully amortized for tax purposes, is transferred and used for a different purpose, no further claim for a depreciation deduction may be made for such equipment. Likewise, if equipment, the total cost of which had been recovered for tax purposes, is subsequently sold, the entire proceeds of such sale would become taxable profit or capital gain. This will require that a record be kept of all equipment installed or constructed in emergency facilities, the cost of which has been recovered through amortization, in order that no further claim for a depreciation deduction will be made for such equipment.

In view of the many provisions and requirements of the Act and the uncertainties of the future, it appears essential that an auxiliary record be maintained of each war facility to show, at least, the following information:

1. Location and description of the facility
2. Necessity Certificate—date and number
3. Date construction or installation was begun
4. Date of completion or acquisition
5. Date amortization was begun
6. Amount advanced by the customer
7. Method used in computing the adjusted basis of a facility where the customer advanced part or all of the cost
8. Unadjusted basis of the facility
9. Adjustments to such basis
10. Adjusted basis of the facility
11. Amount of the monthly amortization.

A detail cost analysis should be made for each war facility. Underlying records should contain references as to the source of all charges. Supporting documents such as invoices, payrolls, automotive reports and expense account reimbursement forms should be carefully preserved in order that they may be readily produced when requested by a Revenue Agent.

If, during the emergency period, the taxpayer should elect to terminate amortization and claim depreciation, it would become necessary to supplement the above information with pertinent data with respect to such change, such as date amortization terminated and the adjusted basis for depreciation. Other factors in individual cases may require the recording of information in addition to that recommended in the foregoing table.

The original election to amortize does not relegate the job of amortization to a clerical task thereafter. Accountants cannot feel secure in their original conclusions. They must be alert to grasp the significance of future trends of taxation and economic conditions as they affect the accounting treatment accorded each war facility.

ACCOUNTING TREATMENT—BOOKS, REPORTS AND STATEMENTS

Amortization of the cost of war facilities in the books of account and for financial statement purposes should be distinguished from the five-year amortization allowed in the Revenue Act for income and excess profits tax purposes. One of the foremost accounting objectives is that all expenses, cost, and losses of an enterprise shall be charged in the same accounting period as the revenue against which they apply. Revenue derived from war facilities should, therefore, have charged against it all determinable expenses and cost applicable thereto. Such charges, however, must be supported by a reasonable basis of measurement and of allocation to the respective fiscal periods. Therefore, the arbitrary assumption of a five-year period for charging off an item of plant investment is in conflict with the accounting concept of the correct treatment of such cost and may, depending upon the circumstances of the case, result in a gross misstatement of income. The controlling factor governing the accounting treatment of amortization in the books of account and in financial statements is whether the usefulness of the facility terminates with or survives the emergency period.

It, therefore, becomes necessary to study each facility individually and determine with as high degree of accuracy as possible its expected period of usefulness, not restricted to its present use, but taking into consideration its expected use after it has ceased to be a war facility.

Generally speaking, in the case of utilities, the study will reveal that many of the items of equipment constructed or acquired for war facilities will be used and useful after the emergency period, and subject to the same factors causing depreciation as other depreciable property. The natural conclusion follows; unless the use of the equipment as a war facility justifies provision for accelerated depreciation, such equipment should be depreciated for books of account and financial statement purposes on a basis consistent with that of other depreciable property.

Conversely, certain war facilities may have a useful life for a period shorter than the five years allowed for amortization for tax purposes; for example, the installation of certain type of sabotage protection equipment and distribution lines or substations constructed for rendering service to a purely defense war industry. In such cases the provision for depreciation recorded in the books of account and reflected in financial statements should give effect to the expected shorter period of useful life of such equipment.

The reserve created for amortization of war facilities, the usefulness of which is expected to expire with the termination of the war, may be segregated or included as a part of the general depreciation reserve. This, however, in the case of utilities, is subject to the accounting treatment that may hereafter be prescribed by regulatory authorities having jurisdiction.

Under no conceivable circumstances can the arbitrary charging off of depreciable plant over some arbitrary period fixed by statute or period other than the expected useful life of the equipment, determined with a reasonable degree of accuracy, be reconciled to conform with generally accepted accounting principles. The Honorable John L. Sullivan, Assistant Secretary of the Treasury, recognizing this distinction, made the following statement in the hearings before the

Finance Committee of the U. S. Senate on the Revenue Act of 1942 ". . . but I couldn't say to this committee that it is reasonable to expect that an ultra-modern factory that is to be constructed in the latter part of 1940 or the first part of 1941, built with all of the latest skill and engineering experience, is going to be absolutely useless in 1946. I don't think that is 'reasonable,' and yet I believe it is desirable and prudent to grant this amortization to those companies that are putting up new facilities for this picture." Mr. Sullivan, in the foregoing statement indirectly acknowledges the difference between amortization as allowed in the Code for the sole purpose of encouraging private capital into war facilities, and depreciation as an element of cost. Interpretation SCI No. 7 issued by the Headquarters, Services of Supply, Fiscal Division, War Department, rejects amortization as provided in the Revenue Act as an accurate and equitable measure of cost. Paragraphs 2 and 3 of this interpretation reads as follows:

"2. Amortization of emergency facilities covered by certificates of necessity will not be allowed on the basis established for income tax purposes but depreciation on such facilities at appropriate rates will be reimbursable. The rates used must be justified by the contractor and should be compared with those taken on similar facilities not covered by certificates of necessity. If such a comparative basis is not available, the rates published by the Bureau of Internal Revenue in Bulletin F will be used as a guide by the auditor in considering the propriety of the rates claimed but consideration may be given to the effect of multiple shifts and other pertinent conditions.

"3. If the rates claimed in the current year's tax return have been increased over the approved rates in the return for the most recent year which has been closed, such increases must be specifically justified by the contractor. Unless the justification is clear, consideration will be given to the disallowance of part or all of the depreciation due to the increased rates."

The Statute in no way makes mandatory a recording in the books of account of amortization computed as permitted for tax purposes. Amortization of war facilities was allowed under the revenue acts of the first World War. Although the regulations in effect at that time required that depreciation claimed as income deductions for tax purposes be recorded in the books of account, the special deduction allowed for amortization of war facilities was allowed without regard to the accounting treatment accorded such amounts in the books of account.

Amortization of war facilities over a period of five years is a statutory deduction allowed the taxpayer, provided certain specific requirements are met. The amounts amortized in each fiscal period may or may not be an accurate measure of the loss in value of the incident property for the period involved. This will depend upon the circumstances for each individual facility of each individual company.

The fields of accounting and corporation finance are so closely correlated as to cause the utility accountant, serving in a dual capacity as accountant and financial officer, to confuse the principles applicable to each field. The accounting principle of matching all expenses and costs (scientifically determined) against the revenue for a given period may under certain circumstances seem in conflict with the principle of "conservatism." The latter, although generally referred to as an accounting principle, might more logically be recognized as a principle of business finance.

The Committee on Accounting Procedure, American Institute of Accountants, realizing the probable necessity, due to the effects of war, for creating special reserves by many business enterprises, and the importance of correct accounting therefor, made a study of this subject and published its recommendations in its Accounting Research Bulletin No. 13, entitled "Accounting for Special Reserves Arising out of the War." This Committee, in its recommendations, gives cognizance to two general classes of special reserves in the following statement quoted from the aforementioned bulletin:

"While no attempt is made in this bulletin to classify specific reserves, they fall, for accounting purposes, into two groups: (a) those reserves or parts of reserves which must be provided in order to conform to accepted principles of accounting and (b) those additional reserves created in the discretion of Management as a matter of conservative business administration, but which are not presently determinable within the limits necessary for definitive accounting statement.

Reserves for such items as accelerated depreciation and accelerated obsolescence, *amortization of emergency facilities* (italics added) and deferred maintenance, will ordinarily fall in the first group. Reserves such as separation allowances to employees (where there is no legal obligation to make payment or no established policy) and losses due to excess capacity after the war will ordinarily fall in the second group. Some reserves may fall in part in each group. Doubts as to the proper classification should be resolved in favor of inclusion in the first group."

Two questions require answers:

(1) What reserves are necessary for the correct determination of income?

(2) What reserves are necessary to provide a prudent degree of conservatism?

Generally, these reserves are fed from different sources and must be accorded different accounting treatments. In classifying reserve provisions as between the two, and in applying the appropriate accounting treatment in books of account and in the preparation of financial statements, the accountant must be guided by the established accounting principle that reserves are not to be used for equalizing income of different accounting periods. Reserves may be used for equalizing dividend distributions, but such reserves should be created by a charge to earned surplus and should be credited back to earned surplus if not entirely consumed in satisfying the purposes for which they were created.

As stated by the Committee of the American Institute of Accountants, a reserve for amortization of war facilities would ordinarily fall in the first group. Provisions made for such reserve should conform with the aforementioned, long-established accounting principle. It then follows that the arbitrary charging off of emergency facilities in the books of account over the five-year period provided in the Act, or over any period other than the expected useful life of the equipment, is in direct conflict with this generally accepted accounting principle.

Regulatory Commissions are giving consideration to the tax savings afforded utilities by this provision of the Act, viewed principally from the standpoint of conservatism. The following statement is quoted from the 1942 Report of the Committee on Corporate Finance, National Association of Railroad and Utilities Commissioners:

"Setting aside accelerated amortization for the moment, it may be argued that there are important advantages in maintaining a substantial degree of uniformity between tax and corporate policies with respect to depreciation. On the other hand, it will undoubtedly be claimed that, in the case of utility companies, accelerated amortization is clearly exceptional insofar as it applies to new facilities which will continue to have a normal service life extending far beyond the end of the war period. Supporters of this view will maintain that it would be both unrealistic, and inconsistent with current prescribed depreciation policy for regulatory authorities to require utility companies to accelerate the depreciation of property greatly in advance of its expected retirement from service. Therefore, if this view becomes accepted policy, with the exception noted in the next sentence, utility companies which take accelerated amortization for tax purposes would not be required to accrue depreciation on their books on that basis but would be permitted to accrue depreciation on the basis of the estimated service lives of the assets concerned. The exceptional type of case is that of companies which have clearly inadequate depreciation reserves on their books. It can be strongly contended that they should

take advantage of the tax savings from accelerated amortization to increase their inadequate book depreciation reserves."

Does the above imply that if a company's reserve is presently adequate, it may be permissible to charge against income, depreciation on a basis consistent with the principle of matching cost against applicable revenue, but in *exceptional types of cases* this principle should be violated and the provision for depreciation be increased arbitrarily by the amount of the tax savings?

The Committee, referred to above, made reference in its report to another treatment of the tax savings as the result of amortization of war facilities:

"Attention should be directed to one feature of accelerated amortization which is of particular importance to security holders. Wherever accelerated amortization is applied to property which will continue in service beyond the war period, it must be remembered that future corporate earnings will be taxed without deduction for any further depreciation of the assets which have been fully amortized for tax purposes. Undoubtedly some means should be employed to disclose to security holders the significance of accelerated depreciation with respect to present and future taxes. One method of disclosure might be that of carrying a footnote explanation on published income statements and balance sheets. Another suggestion, which is somewhat more controversial, is that corporations may find it desirable to credit the tax savings from accelerated amortization to a special surplus account. Under this proposal the amounts in the special surplus account would be released later, year by year, to unrestricted earned surplus to offset the amounts by which subsequent taxes would be higher because of the corporation's inability to deduct normal depreciation on the facilities which then would be fully amortized for tax purposes. Any balance in the special surplus account when the process is completed, owing to changes in tax rates, would be transferred to unrestricted earned surplus. Those who favor this suggestion argue that it would earmark such savings and make them unavailable for immediate dividend distribution; that it would insure thereby the retention of funds needed to finance the construction of emergency facilities; and that it would constitute the best form of disclosure to security holders. The tax savings and the tax increment to which we have referred may be computed either on the basis of the average Federal income tax paid or on a marginal or incremental basis. As a matter of mechanics, it would probably be easier to compute the tax savings on the basis of average taxes. This would have the further advantage of avoiding any possible question as to whether accelerated amortization or some other potential deduction would actually have fallen in the highest tax brackets. The use of the average rate basis of computing tax savings would also better serve the purpose for which it is claimed that the credits to the special surplus account are intended. This follows from the fact that an average rate would tend to conform more closely to future tax rates which would be used to compute the annual amounts subsequently to be released to unrestricted earned surplus, as described above."

The above proposal was also offered as a possible treatment by Leslie T. Fournier of the Securities and Exchange Commission at a hearing November 4, 1942, incident to Virginia Electric & Power Company's application to issue $4,000,000 of notes to help finance the construction of a new power plant to provide capacity for increased load caused by the War effort.

As further evidence of regulatory interest in this subject, the following statement was made by the Honorable Robert H. O'Brien, Commissioner, Securities and Exchange Commission, in an address before the Financial Section, American Life Convention, October 6, 1942:

"There is a real danger, however, which must be avoided, that some companies will engage in a 'big week-end' and pay out in dividends that part of their net income which represents 'tax savings' arising from the accelerated amortization deductions and let the years following the five-year period take care of themselves. Such a policy, particularly if accompanied by debt-financing, would be an invitation to trouble and perhaps distress for the enterprise. It must not be overlooked that after particular assets have been fully amortized for tax purposes, no further deductions with respect to them will be allowed in future tax returns. This means, of course, that taxes—after the five-year period—will be larger than they otherwise would have been. To a large extent, the gains in present 'net income' as a result of accelerated amortization during the five-year period may be considered illusory, since they will be offset to a considerable extent—depending on tax rates and other factors at the time—by correspondingly greater taxes subsequent to the five-year period. These circumstances require that management make the 'tax savings' unavailable for dividend distribution at this time."

Applying the principle that reserves may not be used arbitrarily for equalizing income, it is evident that the treatment of tax savings proposed in the above quoted excerpts are not appropriate charges against income. The propriety of segregating such savings from earned surplus account is a matter of decision for the officers and directors of each company. The concurrent charges may be made to accounts Miscellaneous Reservations of Net Income or Miscellaneous Reservations of Surplus according to the facts in each case.

Assuming this procedure is adopted, the reserve created would be credited in each accounting period with an amount equal to the tax saving during such period as the result of taking amortization for tax purposes. After termination of the amortization period, the amount in the reserve or special surplus account would be released periodically back to source through which created, spread over the estimated life of the property subsequent to the date amortization ceases.

The difficulty of computing the estimated tax savings is readily apparent. A number of indeterminable factors enter into the computations, such as the tax rates during the war, the tax rates during the service life of the depreciable property after the war, the effect of other changes in tax laws and regulations for a number of years, the duration of the war, and the probable earnings on funds made available through war-time tax savings. The Committee on Corporate Finance of the NARUC proposed two methods of computing tax savings, (1) on the basis of average Federal income tax paid, and (2) on a marginal or incremental basis. It recommends the use of the average basis, citing the following reasons:

(1) It simplifies the computation of tax savings.

(2) It avoids the question as to whether amortization or some other potential deduction would actually have fallen in the highest tax brackets.

(3) It better serves the purpose for which it is claimed that the credits to the special surplus account are intended—this because of the fact that an average rate would tend to conform more closely to future tax rates which would be used to compute the accrual amounts subsequently to be released to unrestricted surplus.

The many provisions of the present tax law are subject to varied interpretations. Such major factors as depreciation allowances, excess profits credit based on invested capital, and in the case of many enterprises, the determination of profits on cost plus fee contracts which are subject to renegotiation, are subject to change. Therefore, the current computation of taxes must, of necessity, be based on estimates which are subject to revisions after regulations are issued and final determinations are made. For this reason and those enumerated in the foregoing paragraph, the difficulty of an accurate present determination of the eventual tax saving as the result of amortization is obvious.

In view of the many uncertainties that obscure the realities of the future, it is impossible to presently foretell the nature or the amount of the provisions that should be made for post-war contingencies. Business enterprises are very much in the position of the building manager who was in a quandary as to where to place lightning rods because he did not know at what point the lightning would strike. Under the circumstances, it seems only logical that the savings afforded taxpayers under the Act as a means of compensation for the risks assumed should not be put in a strait-jacket and restricted to a predetermined possible

use. Due to varying circumstances of individual companies, it is impossible to prescribe a common accounting treatment that would prove most appropriate in each case.

The text of this discussion leads to four definite conclusions:

(1) Income should be charged with depreciation of equipment installed as war facilities, determined on a basis consistent with that for other depreciable property after giving consideration to the characteristics of each individual facility.

(2) The tax savings incident to amortization of emergency facilities for tax purposes, as provided in Section 124 of the Code, represent appropriate increases in net income transferable to earned surplus.

(3) The use made of such savings after they have become a part of the earned surplus is a matter for decision by the officers and directors of the company.

(4) The unsettled nature of present conditions and the indeterminable causes and amounts of future losses and post-war readjustments justify the provision for a reasonable degree of flexibility in the use of any reserves or special surplus accounts created for the purpose of providing for post-war contingencies.

Utility accountants must, of necessity, keep informed of all orders, rules and regulations issued by regulatory authorities having jurisdiction, as they affect accounting practices and methods of reporting. According to the latest information obtainable no accounting requirements with reference to amortization of war facilities have been prescribed by any of the State regulatory bodies or the Federal Power Commission. A letter dated March 27, 1943, signed by William W. Werntz, Chief Accountant, Securities and Exchange Commission, contains the following statement:

"This Commission has not issued any rules, regulations or orders with respect to such accounting and I am not aware of any cases pending in which the matter is under consideration."

"Accounting" as used in the foregoing statement had reference to accounting for war facilities.*

Regulation S-X of the Securities and Exchange Commission requires that where reserves are established to provide for contingencies as a result of war conditions, a full and accurate disclosure of the purposes thereof shall be made in financial statements filed with the Commission. The Commission's Accounting Release No. 42, dated January 8, 1943, is a statement of the opinion prepared by William W. Werntz in which he elaborates upon the extent of the disclosure necessary in order to comply with this requirements of Regulation S-X.

The Interstate Commerce Commission, as far as could be determined, is the only regulatory body that has, to date, prescribed an accounting treatment for the amortization of war facilities. Under its order dated September 22, 1941, it prescribed certain additional accounts to be kept by steam railroads that elected to amortize war facilities for tax purposes. By its order the Commission requires that operating expenses be charged with amortization charges accrued during the accounting period with respect to property on which the carrier has elected to observe amortization accounting for income tax purposes, with a concurrent credit to an account captioned Accrued Amortization of Defense Projects. The order makes no mention of the ultimate disposition of the amounts credited to the latter account. It is of interest to note that the provisions made for loss on emergency facilities as prescribed by this Commission are classified as an accrual account and not as a reserve or special surplus account; also, that the amortization charges accrued in each accounting period are required to be classified by functional operating expense accounts.

Section 19.124-1 of Regulations 101 contains valuable information for the accountant interested in this subject as it affects tax computations. The Regulations as amended contain a number of examples which illustrate the application of the various provisions of Section 124 of the Code.

In concluding, a statement heretofore made is repeated for emphasis. The original election to amortize does not relegate the job of amortization to a clerical task thereafter. Accountants cannot feel secure in their original conclusions. They must be alert to grasp the significance of future trends of taxation, economic conditions, and regulatory requirements as they affect the accounting treatment accorded the cost of each war facility.

* Since preparation of this paper, in its order of April 5, 1943 in the matter of Superior Water, Light and Power Company, Northern Power Company, American Power & Light Company (Holding Company Act Release #4220), the Securities and Exchange Commission required Superior Water, Light and Power Company to charge earned surplus and credit a deferred credit account each year with the Federal tax saving from the exercise of the emergency facilities amortization privilege, with provision that transfers back to earned surplus be made in years subsequent to the amortization period for the amount of excess taxes payable as compared with the amount which would have been payable had the amortization privilege not been exercised.

The emergency facilities constructed by Superior Water, Light and Power Company represented a relatively large proportion of its electric property.

War Materials Now Constitute 64% of Industrial Production

IN its Bulletin for April, 1943, the Federal Reserve Board shows for the first time the distribution of its Index of Industrial Production between war and civilian output. It states that:

"Currently, civilian output is lower than in the five-year period before the war started, and considerably below the level of the autumn of 1941. Output of some types of products, especially metal products, has been drastically curtailed since the outbreak of the war, but in some other lines production for civilians is still as high as or higher than in the period 1935-1939.

"At factories and mines, where a large part of war production is concentrated, output for civilians has declined about two-fifths since the summer of 1941 and about a fourth since the period 1935-1939. War production was a negligible factor in industrial production before 1939, while by March of this year, when the Board's index was estimated at 20[illegible] per cent of the 1935-1939 average, war production accounted for nearly two-thirds of the total. A considerable part of the decline in industrial output for civilians has reflected the diversion to war purposes of materials previously going into output of producer's goods but there have also been important reductions in output of final products for consumers."

Sales of large (industrial) light and power have closely followed the pattern of the Reserve Board's Index of Industrial Production and, by applying the ratios shown on the chart (see page 148) which accompanied the above discussion to these power sales, there has been developed the accompanying table:

	Ratio to Total Industrial Production			*Sales of Large Light & Power (million Kwhr per month)*		
	War	*Civil*	*Total*	*War*	*Civil*	*Total*
Dec. 1940	12%	88%	100%	670	4,780	5,450
Dec. 1941	35%	65%	100%	2,400	4,480	6,880
Dec. 1942	61%	39%	100%	5,000	3,190	8,190
Mar. 1943	64%	36%	100%	5,300	3,000	8,300

The Key to the Apparent Paradox in Electric Power Supply for War

By C. W. Kellogg
President, Edison Electric Institute

Presented before the Midwest Power Conference, Chicago, Ill., April 8, 1943

YOUR Chairman has called attention to the fact that I appeared before you two years ago to discuss the same subject I am covering today. My talk today might therefore be called a sort of report of progress. At the time of my visit two years ago I was an employee of the Federal Government and as such was under prohibition to present any paper without prior approval of the OPM. For that reason my talk was off the record and all I have are the notes and figures upon which it was based. My notes indicate my expectation at that time that the power capacity of the country would prove ample for the defense effort—which has proved to be correct. Yet since then actual installation of new electric generating capacity in 1941 and 1942 fell over 2,000,000 kilowatts below my then estimate of what they would be, while war power requirements have since vastly increased; for my earlier talk was eight months before Pearl Harbor. The record on power developments is a very complete one, and I believe it would be instructive to rehearse briefly what has happened in the two years now ending.

Two years ago to a considerable extent, but today to a preponderant extent, the electric power requirements for war industry are the essential element in the power picture. Up to April, 1941, the largest non-coincident peak load then recorded on the electric facilities, both private and governmental, contributing to the public supply, was 31,500,000 kw. Today the corresponding figure is 36,900,000 kw, or over 15 per cent more. During these two years the installed electric generating capacity went from 42,000,000 kw to 47,000,000 kw, the margin between capacity and peak being now therefore about the same as it was two years ago.

In the earlier period we were preparing for defense, although not at war; now we have been at war for 16 months. Two years ago the defense preparedness program looked like a substantial addition to the great civilian economic life of our nation; today the situation is reversed and war has become our only business, with civilian activity reduced to just enough to keep the war machine going. As measured by government expenditures for defense or war, the last recorded month (February, 1943) showed $5,770,000,000 compared to $593,000,000 in February, 1941, a tenfold increase. In the earlier period the number of men in our armed forces or in munitions manufacture was about 5,000,000; today it is 25,000,000, a fivefold increase. It may seem heartless to try to compress into these cold-blooded figures the story of the transformation of our nation from peace to war, with all the heartaches and dislocation involved, but the figures do show the completeness of the change. The figures certainly make perfectly clear the fact that the magnitude of the two-year change in nationwide power requirements is trifling compared to the change in such basic war factors as I have mentioned.

This contrast between the growth of war industrial production and that of electric power demand becomes even more striking if we break it down between the first and second years of the two-year period just ended. At the end of the first year the increase in the rate of war expenditures, on an annual basis, was about $5,000 for each kilowatt of increase in power demand. In the second year, war expenditures (again on an annual basis) grew about $24,000 for each kilowatt growth in power demand.

Relative Rate of Power Growth

With the general realization of the importance of an adequate supply of power for war industry, combined with the knowedge that our war effort in the present conflict as measured by governmental expenditures is over five times as great as it was in World War I, it would be natural to imagine that the rate of growth in power capacity during World War II had been correspondingly increased. The facts, however, do not bear this out.

While the net growth in electric generating capacity in 1942 was the largest of any year but two in the history of the industry, yet on the relative basis of per cent increase over the then existing capacity, the 5.85 per cent gain in 1942 was only one-half as large as in two years in the mid-twenties.

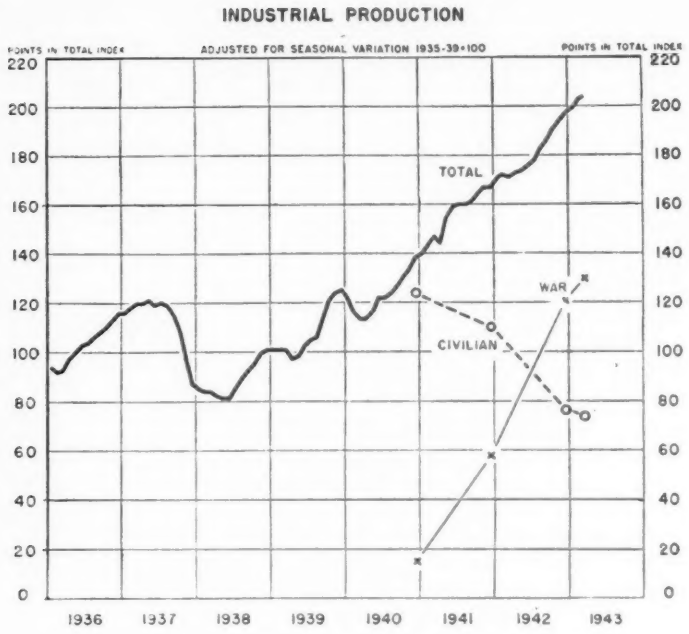
The Power Paradox

This apparent discrepancy between cause and effect requires some explaining, especially when considered in connection with the known increases in the use of electricity, arising from the war effort, that did not exist before. For example: The increased rate of aluminum production in the two-year period required about 1,600,000 kw; increased output for electric steel and ferro alloys during the period required about 700,000 kw additional; magnesium, synthetic rubber, high explosives, smokeless powder and other war requirements all took large amounts of power not needed before. These might be classed roughly as materials; they allow nothing for the huge airplane industry, both bodies and engines, nor do they include the power requirements for numberless Army and Navy installations that did not exist two years ago. How has it been possible to take care of these huge war power requirements with the apparently moderate increases in maximum power load (of 15 per cent in two years) which the record shows to have occurred?

The answer is principally in the substitution of war for peace activities. But it has also been effected by power pooling and by the change to Standard War Time, both being reflected in higher load factor. I should like first to develop briefly the lesser of these factors, and later the matter of substitution.

Power Pooling

The electric power industry has long recognized the savings in capacity that



The figures on physical volume of industrial production for war and civilian purposes are based primarily on estimates for individual industries and have been tested by other calculations but at best are only rough approximations. Data for war and civilian production shown only for December, 1940, 1941 and 1942, and for March, 1943, connected by straight lines. Source: Federal Reserve Bulletin, April, 1943, p. 288. (See also page 146 of this issue of the EEI Bulletin.)

could be effected through the interconnection of adjacent sytems, thus reducing total maximum demands through diversity between systems, saving reserve capacity which could serve for more than one system and generally stabilizing the service for all the interconnected systems. This process had been going on continuously for many years, but particularly for the past quarter century since the close of World War I, so that by the time the war arrived in 1941, 80,000 circuit miles of transmission lines of 60,000 volts or higher had made a veritable network of electrical interconnections throughout all the populous areas, and especially industrial areas, of the nation. Since assuming its duties under the War Production Board, the Office of War Utilities (or its predecessors) has arranged for the establishment of some additional interconnections to strengthen the power supply to areas where heavy war loads were being added to such an extent as to tax existing facilities. It estimates that these new interconnections have had the effect of reducing the combined maximum demand on the systems interconnected by a very substantial amount.

War Time

We have, of course, always recognized the essential point that the amount of electricity a given system can produce depends upon the number of hours per year during which it is operated. Yet the ability to keep up an uninterrupted supply of electricity depends upon the ability to carry the load during the highest single hour of the 8,760 hours in the year. Any arrangement therefore which can cut down the size of the demand in this maximum hour is just as effective for load-carrying purposes as would be the addition of that much generating capacity. Realizing this, the Office of War Utilities obtained the enactment by Congress of Standard War Time, whereby it estimates peak loads have been reduced in the aggregate 1,000,000 kw.

Effect on Load Factor

As I stated before, power pooling and War Time have served to improve the load factor of power systems; that is, to increase the kilowatthour production per kilowatt of peak demand. Additional effective reduction of the magnitude of peak loads which would otherwise have been required has resulted both from longer hours of use of manufacturing facilities through working two and three shifts in war plants and from the increase in the percentage of electricity going into the production of aluminum and into other such processes with essentially long hours of operation throughout the year. The cumulative effect of all these factors has been an increase in national annual load factor to heights never before attained in America. Up to last year the highest annual load factor that had ever been recorded in the public electricity supply was 54.5 per cent. Last year, 1942, this jumped to 58.4 per cent. This may not sound like much to the man on the street, but in terms of equivalent generating capacity and energy output it is formidable.

From the viewpoint of generating capacity, the actual output of 1942, if produced at the highest previously known annual load factor, would have required 2,660,000 kw more generating capacity than was in fact needed on peak in the year—an amount nearly half again greater than the entire net growth during 1942 of the combined non-coincident peak loads on all the electric systems contributing to the public supply.

Looked at from the energy viewpoint, the increase in electric energy output arising solely from higher load factor and obtained therefore without a single kilowatt of increased demand on generating stations, amounted to 12.7 billion kwhr, an amount of additional energy which would produce nearly two-thirds of our aluminum supply; an amount of additional energy equal to nearly two-thirds of the entire output of public supply of the nation in the first year of World War I.

Civilian vs War Requirements

The experience with power supply during the war has shown, I believe, that in our thinking about the subject we have for a long time been trying erroneously so far as electric power needs are concerned to divide our economy into two compartments: Civilian and War. In the early stages of defense preparation, civilian activity was thought of as normal and war activity as something else that had to be taken on over and above normal. As the intensity of the war effort stepped up, especially after Pearl Harbor, it became clear that what really counted was the total productivity of the nation and that the essential question was how completely this total could be applied to the prosecution of the war. We had a certain number of men and

women who could work and a certain amount of materials upon which they could operate, and it was the combination of these two factors that determined how much electricity could be used rather than a subdivision between war and civilian activity. The real question was how could this great reservoir of human and material resources be used on the whole most effectively for the war effort. The stresses and strains resulting from this adjustment process have resulted in differences between various war requirements much sharper than merely those between war and civilian needs. Viewed in retrospect it seems that the paradoxical difference between war requirements and total power requirements can be explained much more through the extent of substitution of war work for civilian activity than through the load factor considerations that have been mentioned.

The Make-Up of Industrial Electric Energy Requirements

All of the figures I have presented as to electric energy production refer to the output of plants, whether governmentally or privately owned, which deliver to the common supply. It is frequently overlooked, in discussing the supply of power for industry, that in spite of all the efforts through the years by the utilities to sell their output to industry, about 33 per cent (in 1942) of the total industrial electric power supply was still made by manufacturers themselves for their own use. So far as the utilities are concerned, the war power supply therefore is in essence only 67 per cent their problem.

This limitation on total industrial power is subject to a further classification, so far as total utility output is concerned, by the fact that in 1942 only 56 per cent of the total sales of electricity in the public supply was for industrial power, the balance having been used for lighting, household tasks, transportation, etc. Interestingly enough, (and as indicating the unbelievable stability of the electric power requirements of our nation) in spite of the great emphasis in recent years on war industrial production on the one hand and the dimout in the coastal sections on the other, this 1942 ratio of industrial to total electric energy (of 56 per cent) was actually about 2 per cent lower in 1942 than it was in either 1926 or 1929. A kilowatt-hour knows no distinction between war and peace but only between total needs of a people as measured by economic activity. We have been prone to forget this complete impersonality of a kilowatt-hour in contrast with our own complete change of viewpoint between a peace and a war psychology.

How Electric Power Requirements Vary

For our own industry a month-by-month study for the five years ending with 1942 shows in an unbroken chain from complete peace to complete war that the electric energy requirements follow most closely the volume of industrial production. A similar study based only on the number of men employed in industry failed to be correct as to peak electric loads during the last two years, doubtless due to longer hours of use of plant equipment under the pressure of war. In fact the error on the high side resulting from the use of this method amounts to 6,000,000 kw.

General Industry Changes Similar to Those of Power

It is worthwhile to consider briefly the great convulsions in specific activities connected with the war, contrasted with the main tide of total industrial activity, of which they must essentially form a part, because there is no other source from which they can arise. I have already mentioned the meteoric rise in government war expenditures from $593,000,000 in the month of February, 1941, when I addressed you before, to $5,770,000,000 two years later. We know also that the index of production of war munitions as a whole (which includes ships, planes, tanks, guns, ammunition and all field equipment) was nearly four times as great at the end of 1942 as at the end of 1941. Naturally individual items in this group showed much more spectacular ratio of growth than the group as a whole. The Department of Labor figures tell us that during the year ending last December the number of men in war industry grew 154 per cent and the number inducted into the armed forces by a much greater per cent. Such figures could be proliferated endlessly. Yet what was the effect on the national economy as a whole while these tumultuous changes were occurring in the specific groups mentioned?

Overall Figures

The overall industrial production index grew but 16 per cent in 1942. The steel tonnage output of the nation has gained but 7 per cent per annum in the last two years. Bituminous coal output (corrected for difference in amount in storage at the end of each year) was but 7.8 per cent in 1942 above its 1941 level. Total industrial employment was up but 9 per cent at the end of 1942 compared to a year before. The combined non-coincident maximum demand on electric systems contributing to the public supply (corrected for the effect of War Time) was up 8 per cent. These figures also could be broadened out without changing the order of magnitude of the resulting figures.

The conclusion seems inescapable that the great reservoir of men, machines and materials which is the basis of the economic and industrial life of our nation is a body whose level changes but gradually from year to year, even under the impact of the greatest war of all time and of the greatest war effort ever made by any nation in history.

The Railroads

Encouraging and excellent as is this record of our industry getting huge amounts of additional electric energy without corresponding increase in demand on generating equipment, an equally striking job has been done during the war by our Steam Railroad Systems. In 1942 they increased their transportation performance, as measured by freight ton-miles, by 33 per cent over 1941, a rate of growth in output nearly two and three-quarters times as great as ours in the electric power industry; and yet they performed this huge additional task with only 1.3 per cent increase in the average number of freight cars loaded per week. This amazing result was achieved by insisting on higher unit car loadings and by speeeding up train movements through better operation and more powerful motive power. This is one more example of the latent capacity in our American enterprise that can be called upon in a great emergency.

Future Trend of Power Requirements

Based on the experience gained to date from the present war, an accurate estimate of future requirements for power calls first for a reasonably accurate estimate of the future course of general industrial activity and second for an estimate of any specific changes that may be expected in surrounding conditions.

As one example of specific changes, the power demand in 1942 was, as estimated by the Office of War Utilities, about 1,000,000 kw less than would have been the case but for the adoption of Standard War Time. If any influence

should cause Standard War Time to be abandoned, a corresponding change in demand conditions would be expected.

There has been some discussion lately by the Office of War Utilities of the possibility of curtailing the use of electricity for non-military reasons simply to save fuel and transportation. The amounts at stake seem small compared to the danger to the public from the adoption of this so-called "Brownout." This would consist in effect of the application to all parts of the country of many of the restrictions now in effect only in the "Dimout" areas along the coasts. The savings resulting are estimated to amount to 2,600,000,000 kwhr per annum, about 1½ per cent of total energy. The full 1½ per cent applied to the present coal consumption of the electric industry (which amounts to but 13 per cent of the total coal consumption of the nation) would therefore decrease the latter by about 0.2 per cent. This small amount seems unwarranted in view of the lowered public morale, the increase in crime and the greater number of street traffic fatalities, which experience has shown to have arisen from the dim-out where its adoption has been made necessary by military considerations.

The Tide Turning in War Expenditures

The week-by-week output of electric energy this year continues up to the present time to show the same substantial gains over the previous year that characterized corresponding periods in both 1941 and 1942, with peak loads growing at a much slower rate due to the causes that have already been commented on.

Signs are not lacking, however, to indicate that the rate of growth of the industrial war effort is reaching a maximum in some features and has already passed the peak in others. The overall war expenditures as reported daily by the Treasury Department were $6,042,000,000 in November, 1942, an increase of 308 per cent over November the year before. Yet expenditures in December, 1942, and January and February, 1943, were each actually less than in November.

Naturally, on account of their once-for-all nature, construction expenditures are falling, the January national total having been 36 per cent below the peak level which occurred in August, 1942; and Heavy Engineering Awards in January just past having been 41 per cent less than the preceding January. But the same effect is observable in other less obvious lines. Major General Campbell, Chief of Ordnance, stated within the month (March 19) that the manufacture of ordnance was far ahead of production of ships to transport it. A joint statement by the War and Navy Departments on February 22 regarding military textile requirements said that maximum rates of production have been achieved and that possibly "military requirements of certain fabrics might be slightly reduced during the current year." At the same time, Secretary Knox, commenting on the need for initial heavy stocking up, said: "Now that the stocking up is largely finished, even a rapidly expanding Navy will require a smaller and more even flow of textiles."

That this general trend is not limited to textiles is indicated by the general activity of all industry. As reported by the National Industrial Conference Board, January, 1943, compared to December, 1942, showed unfilled orders down 2 per cent, shipments down 3 per cent, new orders down 7.1 per cent and the machine tool backlog down 8.1 per cent.

Power Requirements for the Coming Year

Some of you may well ask what has all this talk about trends in industrial activity got to do with the power situation. The answer is that these are the very stuff of which power demands are made. Power is a result of economic demand, not a cause of it. It is valuable only as it is used, and it is used only as it is needed for helping in the economic life of the nation. Based on experience to date, the 4,000,000 kw of new generating capacity scheduled for completion this year ought to be sufficient to care for the nation's electric power needs in 1943 without depleting reserves.

The satisfactory adequacy of supply of this absolutely essential element in the war effort to date has been the result of wise and careful planning through the years. Many of you will recall the order issued by the War Production Board last August 22, stopping construction on 2,200,000 kw of generating capacity in 85 electric generating plants throughout the country then scheduled for completion in 1943 and 1944 and reducing priority rating on an additional 1,890,000 kw in 28 government plants. This was done, however, only for the purpose of diverting critical materials to ends felt to be more essential to the prosecution of the war. The Office of War Utilities is watching the situation constantly and with the greatest care. The nation and the industry have been fortunate in having the overall direction of their power affairs in careful and competent hands.

The order of August 22, 1942, still left 5,500,000 kw of new electric generating capacity for completion through 1943 and the early part of 1944. It calls for completion this year of about 4,000,000 kw of new generating capacity, an increase greater than the growth in demand that occurred in 1942 over the previous year, even after allowing for the effect of War Time, and greater than the probable increase in load in 1943.

Considerations for the Future

Stable as is the overall total of industrial activity, the proportion of that total devoted to war activity is much greater now than it was in World War I, and this may well have considerable effect on the process of resuming full civilian industrial activity after the war is over. There is one unbroken statistical series running through both wars which gives some interesting comparisons. I refer to "National Income Realized." At the peak of the post-war boom following the last war in 1920, this figure stood at $60 billion. The corresponding figure for 1942 was about $112 billion and present estimates place it at $130 billion for 1943. During the earlier war, realized income somewhat more than doubled and approximately the same rate of growth in this war would be indicated by the estimated figure I have mentioned for 1943.

War expenditures have grown much more rapidly than they did in World War I. For the year 1942 alone they were 60 per cent greater than the entire amount spent on the first World War and in the year 1943 they will probably be 150 per cent greater than the entire expenditures for World War I. The change from all this war business back to the industrial and commercial pursuits of peace will tax the native ability of the American people and call for their best efforts, resourcefulness and patience. So far as the electric utility industry is concerned, the inherent stability which enabled it to serve the change from peace to war activity without wide fluctuation will enable it to serve the nation's change back again to the pursuits of peace in a similar fashion. It can be counted upon to contribute its efforts to serve American business and industry in the critical post-war period as usefully and effectively as it is serving in the present terrible struggle.

Well, Folks, It's Been a Long Hard Winter

But Just Look at These Bouquets from the Newspapers—Emergencies Show Communities' Appreciation of Utility Service

A JOB WELL DONE

Public utilities, it seems receive more than their share of adverse critcism and only on rare occasions is tribute paid the firms, their management and their employees. Well, this is another one of those rare instances when all of Gloversville, Johnstown and vicinity can salute the New York Power and Light Corporation and the Upstate Telephone Corporation, their managers and their workers. The feat they have performed in rushing this locality back to normal after the severe ice storm of Wednesday night is little short of a miracle, and probably wouldn't be short at all if the day of miracles had not passed.

At an expense which officials estimate —modestly, too—will run upwards of a quarter of a million dollars, the power company has done everything within its domain to restore lights and heat to the many homes affected by the storm. It is true some people won't be satisfied, believing their areas or their particular situations should have been taken care of immediately. They little realize, or want to realize, that this was not a job which could be done overnight, but one which will take many nights and days. It won't be long now before heat and light are restored to the homes in this vicinity, thanks to the power company employees who have given up a holiday and their normal sleep for many nights.

Amateurs couldn't perform this task, we are sure, as it required the performance of men skilled in the trade of handling live wires. Besides local skilled men, many others were rushed to this section from other areas when the emergency call was sounded. Probably most residents have seen these men at work for the power and telephone companies. They have seen how these workers sped necessary repairs, how they looked from lack of sleep and their appearance from being out in the cold and rain for long hours without rest. With this picture in mind, it is needless to say much more. These public utilities and their workers deserve unlimited credit for their diligent service. Perhaps it took something like this to make us realize how fully dependent we are upon electricity and telephones, and most of all—upon the firms and workers who make possible the use of these services. All residents of Gloversville, Johnstown and surrounding areas express their appreciation for a job well done.—*Gloversville (N. Y.) Leader-Republican.*

UTILITY EFFICIENCY

Many Indianapolis residents realized Saturday night the community's dependence on uninterrupted service by the various utilities. The downtown explosion which crippled power lines plunged much of the area into the darkness of a surprise blackout. Lights were restored after two and one-half hours, although the usual amount of current was not available for all purposes.

Technical experts of the Indianapolis Power and Light Company worked at top speed to restore service. Their success reflected credit on the utility's resourcefulness in coping with a major interruption of normal operations. The blast naturally gave rise to rumors of sabotage, although officials discredit such stories. The experience demonstrated what might happen in the midst of war if enemies sought to cripple the power system of a large city.

Utilities naturally endeavor to provide for emergencies, although some loss of service is inevitable when mains are disabled as they were in Saturday's explosion. The accident illustrates the necessity of maintaining close guard over utilities on whose efficiency important wartime production depends. Under ordinary circumstances, utility operations are taken for granted. Factories and residents are accustomed to throwing a switch or pressing a button to get power and light at any time.

The light company has been doing an excellent job in providing the additional power needed to keep the war industries of Indianapolis humming and in maintaining customary business and home service. Repairing the damage to the conduits will take several weeks, but current requirements will be met. The temporary emergency explains the necessity of keeping armed guards at vital places where subversive action might interfere with gas, water and telephone service. All the utilities are doing their job on the home front.—*Indianapolis Star.*

STORIES WELL TOLD

Stories worth telling are often well told in advertising. That was true of the pages of the General Electric Co. and the Hartford Electric Light Co. which appeared side by side in *The Times* yesterday.

We have an idea that many a reader found those pages as informative as anything else in the paper, and as interesting as anything except perhaps war news. Many of the facts offered by the light company were highly striking. While they were known to many who are well informed, they must have been new to the great mass of readers.

All citizens must have marveled now and again that a company geared to giving peace-time Hartford power and light could, with so little stir, have stepped its facilities up to the point demanded by a vastly increased population and a much multiplied industry. Then came necessity of shifting that augmented plant from oil to coal.

Imagine what it would mean if the boilers that burn 18 tons an hour had to be hand-fired. A small army of coal shovelers would be needed. However handled, the movement of 1,200 tons a day, the load of 240 five-ton trucks, must still be a problem.

Most folks, probably, did not know and were astonished that the 278,000,000 gallons of water which flow through the plant every day in making and condensing steam, is 10 times the quantity the whole Metropolitan District uses. The facts about the boiler house 14 stories tall and the firebox as big as a banquet hall, and about the pipes driven down 115 feet into bed rock to provide foundation for the necessary plant addition, must have ranked with most readers as news worth knowing.

The purpose of the advertisement, of course, was to show how the company had met the requirements upon it. That purpose was well served. The General Electric was speaking for the power and light industry as a whole, which has repeated the local story on a grand national scale.

To a people which has had a smattering of experience with difficulty in obtaining food, the statement that "you

don't have to stand in line to buy electric power" has a real meaning.

That may well be true of other statements by both companies, like the one which pointed that it would have taken 140,000 additional men to mine merely the additional million extra cars of coal that would have been needed if the electric companies had tried to generate the power used in 1942 by means of the machines employed in 1924.

Those things are worth a thought as to why, both here and generally, the electric industry has been able to advance in its methods and in its equipment and is ready, as the Hartford Company demonstrated, to meet unexpected and well nigh overwhelming demands. That is due, in very large part, to the fact that men can invest their resources in such a business in the hope of making a profit and their inventive genius is furnished the incentive of greater rewards for better service.

It may be doubted if a government operated industry would have done as well. That well may be one conclusion many a reader will reach who has actually thrilled at the advertisement's story of achievement.—*The Hartford Times.*

15 UNBROKEN MONTHS!

It is 15 months since Pearl Harbor! And Yet—Think of it! Not a single shortage of Electricity for any War Production Job!

Think again—not a single shortage of Electricity for any community, for any user (Home, Farm, Office, or Factory) in the whole United States!

And, all the time, the demand for Electricity has grown by leaps and bounds to the greatest peaks in the history of the country!

Surrounded by shortages of all kinds, Electricity is the one underlying, essential commodity that is meeting any and all demands.

Now, when a War Production Factory makes its quota these days, it gets an "E" Flag, and proudly displays it, with ceremonies at the raising.

But, not a single Electric Power Company factory, producing millions of Kilowatts, has received or even asked for an "E" Flag.

As a matter of fact, all electric companies operated by Businessmen under Free Enterprise, have silently earned an "E" Flag.

In spite of this great performance, spot checks have indicated that perhaps from one-third to one-half of the Electric Company customers (the Public) think there actually is a shortage of Electricity in the U. S., and are curtailing its use. Why? Because previous Government releases predicted a shortage of Electricity, and because careless writers of magazine and newspaper articles, and others have improperly referred to "dim-outs" and other restrictions as necessary to save electricity.

Future Events Can't Blot Out the past.

Newspapers have reported that the Government has made ready a so-called "Brown-out" order designed to save Fuel and Transportation by causing all communities throughout the country to discontinue certain display, sign, window, and store lighting. While such an order might hurt some businesses, or otherwise affect community life, the Electric Power Companies will be ready, as always, to cooperate to the fullest, especially if the Government feels the restriction is necessary for the prosecution of the war.

Yet it would be unfair to the Power Companies if such an order were put into effect in such a way as to leave the public under any impression that there was or is a shortage of electric generating capacity or ability on the part of their Power Companies who have established such an enviable record in War Time.

On page six of this issue is shown a good ad. of the Gasconade Power Company who serves this territory with electricity. This Company with a few well-chosen words and a simple illustration has graphically and unequivocally informed their customers that they have ample power for everybody.

By the way, have you noticed that electricity is about the only thing you can buy that is still as cheap as ever? Most people are aware of this but it is worth mentioning. Well done!—*Tri-Counties (Mo.) Publications.*

IN THE PUBLIC SERVICE

Last Saturday night an explosion occurred downtown, plunging the entire metropolitan district into darkness. A report went out by radio immediately. Thousands of citizens were interested and excited.

But what you probably didn't know was that calls poured into the emergency headquarters of the Power & Light Co. They were calls from employees. Approximately 200 were busy getting to telephones to find out if they could be of service. About 75 of them were placed at work. It was their hands and brains which brought quick resumption of service.

True, these individuals are the employees of a private corporation. But their devotion to the cause of public service certainly deserves the thanks and praise of this community.—*Indianapolis Times.*

WE'RE THANKFUL FOR LARGE CORPORATIONS

PRAISE the Lord for the large utility corporations!

We hesitate to think of what the situation would be in this storm-stricken area, were it not for the fact that the New York Telephone Company and the New York Power and Light Corporation have unlimited resources to draw from in such an emergency, as regards to personnel, trained repair crews, equipment and material.

The mobilizing of such a large force of men by the two utilities, over 800 in all, the vast stores of material and equipment, would be impossible in the case of privately-owned or smaller controlled corporations. Without these big corporations now, more than thirty communities visited by the greatest ice storm in history might be without communications and electric service for months to come.

When practically the entire transmission line to Cherry Valley from Sharon Springs of the electric power line laid flat on the ground, cross arms broken from the poles, poles broken off at the ground, the power company put a hundred men at work, with latest repair equipment, and rebuilt the line in the record time of three days. These are some of the miracles that can be done with unlimited resources at one's command.

Yes, we can truly say, "Praise the Lord" for the big corporations, especially the utilities. We'll wager you'll never hear another grumble from a resident of this storm-stricken center relative to policy, rates, or anything else pertaining to the telephone and power companies, for they surely have shown conclusively what it means to be served by a big corporation—big in the sense of resources and personnel, and the eternal doggedness and untiring effort to get our communications and electric service back to normal.

Best of all, when one reviews the situation, considering all the damage—estimated at over half a million dollars, no subscribers to the telephone and electric services will probably never see it in our monthly bills. It is just one of those things which the larger companies are able to absorb because of reserve funds and foresight in planning to meet any and every emergency, no matter how great.—*Cherry Valley (N. Y.) News*

Joint Meeting of Engineering Committees

Chicago, May 10th to 13th

MOST of the Engineering Committees of the Edison Electric Institute will meet during the week beginning May 10 at the Edgewater Beach Hotel in Chicago. Since the purpose of each meeting is to discuss the more urgent matters presented by the war economy, such as the utilization of diminished supplies or of substitute materials and the maintenance of operating efficiency, the customary general features of the peacetime joint meetings will be omitted. On the other hand, a greater number of joint meetings of two or more committees will be held in order to conserve the time of each when subjects of the same general import are scheduled for consideration.

The time-tables of each of the committees have required careful scheduling in order to provide the necessary time for concentrated discussion of the many matters pressing for consideration, with the result that other topics, useful in themselves but not immediately important in war time, have had to be deferred to a more suitable time.

On account of the limitation of facilities, one group of committees will meet on the first two days of the week, and the remainder will meet on the two following days. No committee has planned sessions exceeding two days duration.

Program

ACCIDENT PREVENTION COMMITTEE

GEORGE S. DIEHL, Chairman

May 12—9:30 a.m.—Berwyn Room

Statistics Report
A. B. CAMPBELL, Edison Electric Institute, New York, N. Y.
Analysis of 1941 Fatal Accidents
D. C. STEWART, Buffalo Niagara and Eastern Power Corp., Buffalo, N. Y.
How Cooperation Between the Accident Prevention Committee and Transmission and Distribution Committee Can Be Effective in Reduction of Accidents
W. F. NIMMO, former Chairman, T & D Committee
Parts of the National Electrical Code of Interest to Members of the Accident Prevention Committee
ALEXANDER MAXWELL, Edison Electric Institute, New York, N. Y.

May 12—1:30 p.m.—Berwyn Room

Publicity
W. T. ROGERS, Ebasco Services Incorporated, New York, N. Y.
Distribution of Accident Prevention Literature
A. B. CAMPBELL, Edison Electric Institute, New York, N. Y.
Linemen's Cutouts
H. H. BERMAN, Consolidated Gas Electric Light and Power Company of Baltimore
Rubber Protective Equipment
ROY M. GODWIN, Philadelphia Electric Company, Philadelphia, Pa.
Resuscitation and Resuscitation Review Board
W. R. SMITH, Public Service Electric and Gas Company of New Jersey, Newark, N. J.

May 13—9:00 a.m.—Berwyn Room

Round Table Discussion
Employee Training Program
C. N. RAKESTRAW, Cleveland Electric Illuminating Company

May 13—1:30 a.m.—Berwyn Room

(*Closed Session*)
Reports of representatives of other safety groups
Outlook of Program for the Year Beginning July 1, 1943
H. O. SPRINKLE, Monongahela West Penn Public Service Company, Fairmont, W. Va.

METER AND SERVICE COMMITTEE

H. A. HOWERY, Chairman

May 11—9:30 a.m.—Sheridan Room

Closed session. Joint meeting of Meter and Service Committee, EEI, and Committee on Metering and Service Methods, AEIC.

May 11—2:00 p.m.—Sheridan Room

Joint meeting AEIC and EEI with manufacturers' representatives.

NOTE: The Joint Committee on Industry Standards will meet Monday, May 10, at 2:00 p.m. in the North Room.

PRIME MOVERS COMMITTEE

J. A. KEETH, Chairman

May 10—10:00 a.m.—Michigan Room

May 11— 9:00 a.m.—Michigan Room

Reports of standing committees will be brief so as to permit devoting the maximum of time to the round table discussion. Tuesday afternoon, May 11, there will be a joint session of the Prime Movers Committee and the Electrical Equipment Committee. (See Electrical Equipment Committee program for this session.)

ELECTRICAL EQUIPMENT COMMITTEE

R. T. HENRY, Chairman

May 10—9:30 a.m.—West Lounge

Closed session (attendance limited to members, and guests sponsored by members or the chairman)

System Engineering Division

H. A. DRYAR, Presiding

Effect of Daylight Saving and the Dimout
ALEXANDER MAXWELL, Edison Electric Institute, New York, N. Y.

Apparatus and Design Division

B. VAN NESS, Presiding

Apparatus Troubles
F. S. BROWN, Duquesne Light Company, Pittsburgh, Pa.
Joint Committee—Circuit Breaker Reports
R. W. WILBRAHAM, United Engineers and Constructors, Inc., Philadelphia, Pa.
Joint Committee—Fuse Report
R. T. HENRY, Buffalo, Niagara & Eastern Power Corp., Buffalo, N. Y.

May 10—2:00 p.m.—Ballroom

Joint Session—Electrical Equipment Committee and Transmission and Distribution Committee
(See Transmission and Distribution Committee Program for this session)

May 11—9:00 a.m.—West Lounge
(Closed Session)

Operating and Maintenance Division

H. S. FITCH, Presiding

Round Table Discussion of War Time Problems, with lead-off discussions on:
Air Raid Protection
A. V. DEBEECH, Canadian and General Finance Co., Toronto, Canada
Personnel
E. S. FIELDS, The Cincinnati Gas and Electric Co., Cincinnati, Ohio
Priorities
H. S. FITCH, West Penn Power Company, Pittsburgh, Pa.
Plant Protection
C. T. HUGHES, The Connecticut Light and Power Co., Waterbury, Conn.
(Following a brief recess the meeting will reconvene in Open Session)

System Engineering Division

H. A. DRYAR, Presiding

System Voltage Regulation under War Time Conditions
A. E. SILVER, Ebasco Services Inc., New York, N. Y.

Meter and Service Division

A. E. SILVER, Presiding

Report of Meter and Service Committee
H. A. HOWERY, Kansas City Power and Light Co., Kansas City, Mo.

May 11—2:00 p.m.—Michigan Room

Joint Session—Electrical Equipment Committee and Power Movers Committee.

Emergency Measures to Increase Output of Generating Systems
A. C. MONTEITH, Westinghouse Elec. and Mfg. Co., E. Pittsburgh, Pa.
R. P. CRIPPEN, Ebasco Services Inc., New York, N. Y.
C. M. LAFFOON, Westinghouse Elec. and Mfg. Co., E. Pittsburgh, Pa.
Description of Frank R. Phillips Station
(a) Electrical Features
F. S. BROWN, Duquesne Light Co., Pittsburgh, Pa.
(b) Mechanical Features
T. E. PURCELL, Duquesne Light Co., Pittsburgh, Pa.

TRANSMISSION AND DISTRIBUTION COMMITTEE

E. V. SAYLES, Chairman

May 10—9:30 a.m.—Ballroom

Underground Group

T. G. HIERONYMOUS, Chairman

Impulse Voltage and Sixty Cycle Life Tests on 22 Kv cable Terminals
W. P. COOK, Duquesne Light Co., Pittsburgh, Pa.
Increase in Accident Rate Due to Lower Standards During Wartime
W. F. NIMMO, Virginia Electric & Power Co., Norfolk, Va.
Reports
Periodic Proof Testing of Cable—W. M. Ghen, Duquesne Light Co., Pittsburgh, Pa.
Cable Operation Report—A. B. Campbell, Edison Electric Institute.
A. C. Network Operation Report—A. Bodicky, Union Elec. Co. of Missouri, St. Louis, Mo.
Non-Oil Filled Transformers—M. W. Ghen, Duquesne Light Co., Pittsburgh, Pa.
Round Table Discussion Subjects
Problems Resulting From 100 per cent Normal Loading of Net Work Units
Artificial Cooling of Underground Cable in Ducts
Permissible Maximum Copper Temperature of Paper Insulated Cable Manufactured Previous to 1925
Low Tin Content Solder and Lead Burning
Resume of WPB Orders Affecting Cable Purchases
Operating Experience and Inspection Practices in Connection with Current Limiters and Fuses including Coordination with Network Protector Fuses on Underground AC Network
Practices Regarding Fusing of Customers' Services Experience with Welded on Transformer covers, including Methods used to remove Covers when necessary
Operating Experience to date with low Pressure Gas Filled Cable Overheating of Conduit Line Running Under Coal Storage Piles
Cable Sheath and Joint Failures Resulting from Ratcheting action and Migration of Oil under Pressure
Frequency of Inspection and Maintenance of Underground Systems during Wartime
Methods of Clamping or Supporting Vertical Riser Cables and resulting experience
Purchasing Cable from Reserve Stock of other Utilities

May 10—2:00 p.m.—Ballroom

Joint Session with Electrical Equipment Committee.

Problems Involving Post-War Planning will be discussed as follows:
Introduction of Post-War Planning—F. E. SANFORD, Cincinnati Gas & Electric Co., Cincinnati, O.
Post-War Planning—B. M. JONES, Duquesne Light Co., Pittsburgh, Pa.
General Discussion of Post-War Planning with Reference to:
(a) Load Growth Possibilities
(b) Post-War Service Standards
(c) Post-War Improvement Projects
(d) Effect of Termination of War-Time
(e) Will the Five Year Period After World War II Follow the Pattern of the Five Year Period After World War I?

May 11—9:00 a.m.—Ballroom

Discussion of work of Accident Prevention Committee as It Concerns the T & D Committee
Report on Distribution Transformer Standardization
A. E. SILVER, Ebasco Services Incorporated, New York, N. Y.
Discussion of Fuse and Cut-out Standardization
C. C. CORNELIUS, Kansas City Power & Light Co., Kansas City, Mo.

May 11—2:00 p.m.—Ballroom

Round Table Discussion on Maintenance Problems:
F. E. SANFORD, Presiding, Cincinnati Gas and Electric Company, Cincinnati, O.

PERSONALS

JAMES W. PARKER has been recently elected vice-president and general manager of the Detroit Edison Company.

Following his graduation from Cornell in 1908 he was employed by the DeKalb (Ill.) Power and Light Company and the Vincennes (Ind.) Street Railway Company as operative and chief plant engineer respectively. At the Detroit Edison Company he started as boiler room engineer of the old Delray plant. Later he was in charge of the design and construction of the Conners Creek, Maryville, Trenton Channel and Delray No. 3 plants of the company.

Prior to his election as vice-president and general manager of the Detroit utility, Mr. Parker was vice-president and chief engineer of the company. The general managership had been held by Alfred C. Marshall, re-elected president, who had held the position since 1923. In 1940 Mr. Marshall succeeded the late Alex Dow as president.

PRESTON S. ARKWRIGHT, president of the Georgia Power Company, Atlanta, has been appointed to serve on the newly created Southeastern War Labor Board. The Board, which will make final decisions in dispute cases in wage and salary adjustments in the Fourth Region, is composed of three panels representing the public, industry and labor. Mr. Arkwright will serve on the industry members' panel.

JOHN BANKUS has been appointed chief engineer of the Portland General Electric Company. Mr. Bankus, who has been identified with the company for 20 years, recently as assistant chief engineer, succeeds Walter E. Brenton, who resigned recently upon being commissioned a Lieut.-Commander in the U. S. Navy.

A native of Oregon, Mr. Bankus is 53 years old and a graduate of the University of California in electrical and mechanical engineering. Following brief employment with the Southern Pacific Railway, he joined the engineering staff of the Crown Willamette Paper Company on heavy installation work. He enlisted in the Navy in 1918 during the first World War and at the conclusion of the war joined the Portland General Electric Company where he has continuously and successively been in the positions of assistant engineer, electrical engineer and assistant chief engineer.

Mr. Bankus has for a number of years had particularly under his direction the building of the transmission lines and new substations, the rebuilding of the company's principal steam plant in Portland and had noteworthy responsibilities in the building of the company's hydro-electric plant at Oak Grove. Likewise, Mr. Bankus assisted in the building of the Northwestern Electric Co.'s steam plant in Portland. He has worked closely with the Bonneville Power Administration in working out its system of interconnections with Portland General Electric.

KENNETH B. PANCHOT has been appointed local manager at Tacoma, Wash., for the Puget Sound Power and Light Co. Mr. Panchot joined Puget Sound Power and Light at Chehalis in 1940, following seven years with Pacific Power and Light Company.

FERRIN T. GRIEST has been named secretary of the Dayton Power and Light Company succeeding OHMER E. HOWLAND, who recently resigned as director, vice-president, secretary and assistant treasurer of the company.

Mr. Howland was associated with the Dayton utility approximately 34 years. His first assignment was that of general bookkeeper. After the Dayton Power and Light Company was organized in 1911 he became auditor. Two years later he was made assistant secretary and assistant treasurer, which position he held until April, 1917, when he became director, secretary and treasurer. In 1937 he was elected vice-president, secretary and assistant treasurer.

Mr. Griest began his association with the utility industry in 1906 with the Citizens Electric Company, Dayton, which was purchased by the then new Dayton Power and Light Company in 1911. In March, 1917, Mr. Griest was made assistant secretary and assistant treasurer of the company, positions which he held until his recent election as secretary and assistant treasurer.

GEORGE SELLERS has been named assistant secretary of the company.

H. P. WHITEHEAD, formerly connected with the operating department of the Georgia Power Company, Atlanta, has been appointed assistant division superintendent of the Atlanta division of the company. Mr. Whitehead succeeds A. J. ROBERTS who has been made assistant to the manager of transportation. Mr. Whitehead who before his recent promotion was supervisor of special construction, has been with the company since 1929. Prior to that time he was employed by the Westinghouse Electric and Manufacturing Company at Baltimore and Pittsburgh.

BERNARD F. BRAHENEY, a vice-president of the Northern States Power Company of Minnesota, has been elected treasurer to succeed JOHN J. MOLYNEAUX, who has retired from active duty after 26 years of service. Mr. Molyneaux has also retired as vice-president, treasurer and director of the Northern States Power Company of Delaware and has been succeeded in these capacities by Mr. Braheney.

Mr. Molyneaux was born in Chicago and his early business experience was obtained in the field of commercial and investment banking and public accounting. Before going with the Northern States Power Company in 1917 he was supervising auditor of the Southwestern properties of the Standard Gas and Electric Company and the Ottumwa Railway and Light Company. He served as treasurer and general auditor of the Northern States Power Company until 1931 when he was elected vice-president, treasurer and director.

Except for a period of about a year in 1912-13 when Mr. Braheney was paymaster of the Appalachian Power Company, Bluefield, W. Va., and was connected with the Louisville Gas and Electric Company his business life has been largely devoted to the Northern States Power Company and companies that preceded it and to the Byllesby Engineering and Management Corp. He started in 1910 with the Consumers Power Company, a predecessor of Northern States Power, and in 1913 joined the Minneapolis General Electric recently merged into Northern States.

In 1915 he became assistant general auditor of Northern States Power Company, in 1920 assistant general auditor of the Byllesby Engineering and Management Corp., and the following year general auditor. In 1929 he was elected vice-president in charge of accounting and in 1936 was made vice-president in charge of accounting and finance. This office he held until last October, when he returned to Northern States, having been elected vice-president in charge of finance. In his new capacity as vice-

president and treasurer he will have charge of finance and accounting.

PAUL PLUMMER has been appointed superintendent of electrical construction and maintenance for the production department, United Illuminating Company, New Haven and Bridgeport, Conn. RICHARD MILLER is now chief system operator and both report to C. A. MOLSBERRY, general superintendent of production. MICHAEL MURPHY has been appointed assistant superintendent of the English station in New Haven reporting to JOHN CLARK.

ARTHUR L. CLOUGH, Oklahoma City district manager for the Oklahoma Gas and Electric Company, has been promoted to southern division manager, succeeding Henry E. Bowen, resigned. Mr. Clough has been identified with Oklahoma Gas and Electric for 21 years. Mr. Bowen resigned as southern division manager to engage more directly in the war effort. He went to Ardmore as southern division manager in 1941, following five years as manager of the northern division. Starting with the company in 1921 as an electrician's helper, he served in a number of towns and a variety of capacities. LEO C. O'BRIEN, for the past 16 years auditor of the western division, has been made manager of the Oklahoma City district. Mr. O'Brien has been continuously connected with Oklahoma Gas since 1915, with the exception of time spent in the Army during World War I.

JOSEPH D. LAWRENCE has been appointed district manager of the Logan District in the Huntington division of the Appalachian Electric Power Company at Logan, W. Va. Mr. Lawrence has been connected with Appalachian Electric Power since 1923 and has been district manager of the Williamson district for the past 14 years.

Electric Water System Care and Maintenance Booklet

THE Electric Water Systems Council will soon have available (the first week in May) a manual on "Timely Tips for the Wartime Care and Maintenance of Electric Water Systems." This manual, in addition to general instructions on the proper care of water systems, has a section on general motor care, replacement of fuses, and general suggestions on extending the usefulness of existing water systems. The booklet will be made available at very low cost so that utilities can make extensive distribution to the farm customers, either directly or through group meetings, county agents, and others contacting farm customers. As a part of the Water Systems Council program, numerous publicity articles on the care and maintenance of electric water systems will be prepared and given widespread distribution in the trade press through educational groups by the state colleges, and through extension training programs.

CONVENTIONS AND MEETINGS

MAY

6-7	Pennsylvania Electric Association, Systems Operation Committee, Hotel Brunswick, Lancaster, Pa.
10	Association of Iron and Steel Engineers, William Penn Hotel, Pittsburgh, Pa.
10-11	Arkansas Utilities Association, Marion Hotel, Little Rock, Ark.
10-11	Electrical Equipment Committee, EEI, Edgewater Beach Hotel, Chicago, Ill.
10-11	Meter and Service Committee, EEI, Edgewater Beach Hotel, Chicago, Ill.
10-11	Prime Movers Committee, EEI, Edgewater Beach Hotel, Chicago, Ill.
10-11	Transmission and Distribution Committee, EEI, Edgewater Beach Hotel, Chicago, Ill.
10-14	National Fire Protection Association, Palmer House, Chicago, Ill.
12-13	Accident Prevention Committee, EEI, Edgewater Beach Hotel, Chicago, Ill.
12-13	Southeastern Electric Exchange, Henry Grady Hotel, Atlanta, Ga.
16-17	The Dakota Central Station Conference, Marvin Hughitt Hotel, Huron, S. D.
20-21	Pennsylvania Electric Association, Electrical Equipment Committee, Altoona, Pa.
20-22	North Central Electric Association, Annual Managerial Meeting, Edgewater Beach Hotel, Detroit Lakes, Minn.
24-26	National Electrical Wholesalers Association, Statler Hotel, Buffalo, N. Y.
27-28	Westinghouse Agent-Jobbers' Association, Hotel Statler, Buffalo, N. Y.

JUNE

2	Edison Electric Institute, Operating Committee, Waldorf-Astoria Hotel, New York, N. Y.
3	Edison Electric Institute, Annual Meeting, Waldorf-Astoria Hotel, New York, N. Y.
9-10	National District Heating Association, Hotel Schenley, Pittsburgh, Pa.
17-18	Canadian Electrical Association, Annual Meeting, Seignoiry Club, Province of Quebec, Can.
28-30	American Society of Testing Materials, Pittsburgh, Pa.

JULY

1	American Society of Testing Materials, Pittsburgh, Pa.

Electric Utilities Cooperating

(*Continued from page* 138)

interest of National Nutrition Program as well as other government endorsed wartime activities.

In every instance the companies reporting indicated full-hearted cooperation with the local Red Cross organizations and other local groups.

The Home Economists have continued to go into homes, particularly where it was possible to render assistance to a group of women at one time.

The Home Service Departments of the utilities have prepared special p phlets of mimeographed sheets on n planning, offering many ways of tak advantage of more abundant foods stressing the high nutritional value certain foods. Their activities also clude group meetings and especially pared material for the various meth of food conservation outlined. This cludes canning, dehydration, fr foods, etc. These activities were ai at helping the family preserve the n nutritional foods with a minimum of vitamins.

While the National Nutrition gram was undoubtedly one of the m important phases of the Home Ser Departments' yearly activities, they wise cooperated closely with other ernment programs such as Conserv of Waste Fats, educating and assi housewives on Point Rationing, and viding substitute foods to replace which it is difficult to obtain, to men only a few of the many cooperativ tivities of the Home Service group.

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